

# FAR EASTERN REVIEW

*In this Number —*

**AN WE TRUST  
JAPAN?**

FRANKLIN D. ROOSEVELT

“THAT LYTTON REPORT”  
WASHINGTON, GENEVA AND THE  
FAR EAST  
AN EXPERT’S OPINION

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## Shall We Trust Japan?

By FRANKLIN D. ROOSEVELT

*A very special significance attaches to this article at the present time, for not only is it from a source that stamps it with high authority, but it deals directly with and to a great degree answers major questions of the hour. The article was written after the distinguished author had completed a long period of service at Washington as Assistant Secretary of the Navy, not only before and during the World War, but also after the Armistice. It was at that time that the policy of building the greatest navy in the world—to be prepared for the immediate contingency of a possible war with Japan, while the Anglo-Japanese alliance was still in effect—was rapidly being put into operation. At that time Franklin D. Roosevelt had won a distinct place as an American naval authority. Treaties, ententes, friendship societies, all have a place in the expression of good feelings between nations, but, when the naval men of one land sincerely recognize a spirit of honest goodwill in the naval men of another, there is usually reality behind it.—Editor's Note.*

\* \* \*

WHY do so many Americans, after witnessing the devastation and the futility of war, continue to think of Japan and the Japanese in terms of war? Why have so many Japanese a similar mental attitude toward the United States? Is this mutually apprehensive habit of mind, to whatever understandable origins it may be due, justified to-day?

It must be noted that, up to 1898, relations between the United States and Japan had been largely sentimental. We justly believed that we had been instrumental in awakening Japan to western civilization. Japan seemed to be appropriately grateful for the more abundant life thus opened to a formerly hermit nation. The awakened Japanese government sent its picked sons to us for education in the new methods. Among others the future Admiral Uriu, who last summer in Japan entertained his Annapolis classmates and Secretary Denby, came to the United States naval academy. Commercially the two nations were not yet rivals, there were no military points of contact and the Japanese had not yet migrated to California in any large numbers.

There has been, however, an apprehensive habit of mind in both countries for many years. When for the first time, in 1898, the American flag adventured territorially overseas, "imperialism" became a brand-new topic with news value on both sides of the Pacific. Discussion as to the defenses of the new insular possessions of the United States began immediately thereafter in military and naval circles and spread thence to the newspapers, which gave to the whole subject an exaggerated importance. Anti-imperialists used the threat of taken-for-granted Japanese aggression to bolster up their otherwise academic arguments. So, too, the Japanese, finding a new and pushing western power in their southern back yard, used the new American developments following the Spanish-American war, with the presumably changing foreign policy contingent thereupon, as a sufficiently obvious argument for popularizing naval expansion.

During the next decade both nations expanded enormously in naval armament and Pacific commerce. In 1904-1905 Japan defeated Russia and by the peace of Portsmouth overflowed with military rule, colonization, railway development and manufactured goods into Korea and Manchuria. And, to make the situation more delicate, our own Pacific coast, adding political irritation to commercial jealousy and growing suspicion, developed a "Japanese Peril."

What more natural than that the two nations should begin to consider the possibilities of war? Outside the executive departments at Washington it has never been known in this country that,

during ten nervous days in the early summer of 1908, the United States hovered on the edge of an ultimatum from Japan. Yet long before the events of 1914 centered attention elsewhere, an American-Japanese war was the best bet of the prophets. Its imminence began to be taken for granted. Responsible journalists, not only in America but in Europe as well, alluded to it as merely a question of time. To-day, in 1923, although the much anticipated war is not even seriously considered, many people in both nations cling to the old habit of mind.

But has not the time come to change our hypothesis? The feeling of the past was largely a natural result of new alignments and new problems. In international affairs novelties are apt to arouse suspicion. We have not forgotten the apprehension awakened in England and in Australia by Japanese naval operations in the Pacific archipelagoes in 1914-1915. More recent experience presents the vivid example of the general consternation caused all over Europe and, to a lesser degree, in this country, by the phoenix-like rise of the Turkish nationalists under Kemal and the consequent changes in the political map of the Levant. As for the mutual distrust that has undoubtedly been characteristic of Japan and the United States during recent years, I am firmly convinced that it was the perfectly logical outcome, not of any one cause, but of a series of almost inevitable causes based on new conditions, which were practically forced on both governments. The question therefore resolves itself into this: Have these causes been, or can they be, sufficiently removed so that a new point of view may be substituted for the old? Can the two nations henceforward base their thoughts of each other on the assumption of peace?

### A Naval Strategical Deadlock

The first answer that occurs—and perhaps the most pertinent—is that the race for naval supremacy has been at least temporarily checked by the Washington conference in 1921. The lifting of the burden of stupendous naval programs was financially important, especially to Japan, and the suspension of competition in the principal types of warships has already done something to allay war talk.

To my mind, however, there is another phase of the Washington Conference which, though generally overlooked, has a curiously important bearing upon the future relations of the two major Pacific powers. I refer to what may best be called the naval strategical deadlock which has been created. After 1898 every high officer in the army and navy of both Japan and the United States, together with many selected junior officers, had spent days and weeks and months in studying what, aside from the question of German imperialistic designs in the western hemisphere, was in this country the cardinal war problem. From my own knowledge, for instance, it may be stated that the general board of the navy and the general staff of the army of the United States, together with the joint board representing both services, used to study with the utmost care the problem of the defenses of the Philippines.

And it may now be said, in reviewing these conferences, that the distance of the islands from our continental shores and the lack of adequate bases on the Pacific coast, in Hawaii, Guam and the Philippines themselves led many officers of both services to admit that in the event of war with Japan the Philippines could not be

held. This, remember, was ten years ago, before the extraordinary development of the submarine and of aircraft. The Japanese fleet, to be sure, was at that time numerically far inferior to our own—less than half its paper strength—but military and naval men knew the almost insurmountable difficulties of maintaining a preponderant American fleet in Asiatic waters. The line of communication was too dangerously long. On the purely military side our army experts found an almost hopeless situation. Though the defenses of Corregidor Island in Manila Bay might prevent a repetition of Dewey's exploit of 1898, what could a handful of American troops be expected to accomplish if an invading Japanese army were once landed at almost any other of innumerable practical locations on the coast of Luzon? Nevertheless, just so long as the race of naval armaments continued, our responsible officers of the higher commands continued vigorously to make the best plans possible for the defense of American possessions in the Far East. And these plans, with the jeopardy they implied, were evidences of the need for the appropriations asked in the annual bills presented to Congress.

These labors have been, if not terminated, at least materially changed by the Washington Conference of 1921. A reorientation, so to speak, of naval matters began with the ratification of the naval treaty by the three ranking naval powers. For the next ten years the American navy is to be roughly as five is to three of the Japanese navy. Furthermore, the United States has agreed not to add any fortifications in the Philippines or in Guam. To say "add" is perhaps a euphemism; for no fortifications now existing there can be, in the light of the last war, seriously considered.

During these earlier years, I remember, the wiser officers and statesmen on this side of the water were convinced that a war between the United States and Japan would have been likely to result in a military deadlock. For the United States to have held the Philippines would have been, as I have indicated, a scarcely achievable task; for the Japanese to have invaded—or rather to have maintained any invasion—on our Pacific coast would have been an impossible task. If, with a fleet double the size of Japan's and our vastly greater resources, invasion of the western shores of the Pacific was admitted to be probably impossible, certainly impracticable, for us, how much more formidable was the corresponding problem presented to the military strategists of Japan! It must not be forgotten, moreover—the point will bear the emphasis of repetitions—that this impasse was reached before the days of effective submarines and aircraft, and that even at that time, when offensive operations over long sea-distances were less difficult than now, war would, in all probability, have been decided on economic issues. And in these the United States had, and has, a vast superiority.

### Public Misses Essential Facts

Nevertheless, public opinion was not then educated to such a point of view and, frankly, no considerable portion of it in the United States yet grasps, I am inclined to think, the essential facts of the military situation. Many of us have not forgotten the real scares during the great war over the possibility of Japanese-German secret bases in Mexico and even in Alaskan waters. If it is probably true that prior to 1921 a strategical naval and military deadlock existed, it is certainly true that neither Japan nor the United States recognized the fact.

As long as ten years ago naval experts said that a fleet crossing a wide ocean from its home base must of necessity lose from a quarter to a third of its fighting value. If that judgment was true ten years ago, then the principle is even more true to-day; for the addition of two new dimensions, under water and in the air, to the fighting-area has made the protection of the capital ship—super-dreadnought or battle cruiser, the fundamental fighting-unit—a much harder task than it was then. If our naval experts a decade ago doubted whether we could hold the Philippines with a fleet more than twice as powerful as that of Japan, what would they say to-day, when we have a fleet rated as only five to three with that of Japan—in actual efficiency of material and number of personnel the ratio is actually now lower than that agreed upon—and the new instruments of warfare capable of intensive use over a short radius, undeveloped ten years ago, have now been enormously multiplied? And on the other hand, even if Japan in 1914 had any false notion that she could threaten us either through Mexico or by direct invasion of the Pacific coast, it is safe to say that her strategists have now tacitly abandoned such ideas.

Nobody, presumably, after all the prophets of 1914 have been proved without honor in any country, would attempt to say what

would happen at the end of a military deadlock between Japan and the United States. After the first year or two of hostilities economic causes would become the determining factor. Tableau: Japan and the United States, four or five thousand miles apart, making faces at one another across a no-man's water as broad as the Pacific. Some genius might then arise to ask what it was all about and what the use was of the atrophy of national life and development. Or, to take a pessimistic view, jingo counsels might prevail in both nations until one or the other, or both, had bled to death through the pocket-book. If, then, it were realized by the people of this country and of Japan that a war would be a futile gesture, attended by no sufficiently compensating results, each nation might be in a fair way to change its apprehensive habit of mind.

### A "Gentlemen's Agreement"

Nearly a year and a half ago the Washington Conference terminated its work and signed the naval agreement. Great Britain, Japan and the United States—the three participants chiefly affected by it—promptly ratified it. Since neither of the two non-ratifying powers, France and Italy, entered seriously into the naval situation, there was consequently a gentlemen's agreement or understanding effected impliedly on the part of Great Britain, Japan and the United States whereby the terms of the formal naval treaty should be carried out with the same force as if all five signatory powers had promptly ratified. Great Britain has faithfully lived up to her part of the agreement, a recent attempt to show bad faith, in the matter of alterations to capital ships such as to permit an increase elevation and consequent greater range of turret-guns, having been proved (March 22) entirely without grounds. Japan, contrary to her tactics on certain past occasions, has lived up not only to the letter but to the spirit of the treaty. Premier Hara, in sending his delegation to the Washington Conference, emphasized the chance thus afforded his nation and government to become established on a new basis of faith. Under the leadership of Premier Kato, the government has seized this opportunity. It has indeed been at pains to show the highest form of *bona fides* in connection with the engagements entered into at Washington, even though each and every one of the terms to which the Japanese delegates subscribed involved some national sacrifice, of prestige, of political ambition, of dignity.

With regard to the scrapping of capital ships, the peculiar situation in which Japan's chief delegate and present Premier found himself has escaped due appreciation. Kato, Admiral Kato, it must be remembered, is the creator of the Japanese navy. When therefore as a member of the big three of sea-power he was called upon to vote for drastic naval disarmament, and later on obliged as premier to carry out to the letter his national undertaking, he was performing a renunciatory act far more searching than the colder statesmanship of Mr. Hughes or Mr. Balfour. Kato and his colleagues, at the instance of a rival naval power, that power whose naval rivalry was most immediately threatening to Japan, were called upon to destroy what he himself had patiently created and built up during sixteen years of serious political and financial difficulties.

Kato proved himself capable of that great gesture and, what is more important, capable also of the less dramatic performance. The scrapping of naval vessels condemned by the treaty has gone forward faster in Japan than in this country. The historic naval base at Port Arthur, endeared to the Japanese by every consideration of national sentiment, has been abandoned, and the larger one on the Japanese mainland at Maizuru has also been dismantled. It may be contended that neither of these stations has great strategical value, but this is an open question. In any event, the Japanese have carried out their pledge.

On July 2, 1922, the Japanese withdrew their garrison of five hundred men from Hankow on the Yangtze and on October 26 of last year evacuated Siberia, according to their treaty engagements, with the last of a division which approximated twelve thousand men. About a month later, on or about November 22, they gave up their radio station on Russian Island, Siberia. Later, on January 1 to be exact, they gave up all their post offices in China with the exception of those retained along the line of their South Manchuria railway. This was precisely according to agreement.

It may be remembered that the Chinese delegates at Versailles refused to sign the peace document because of the reservation to Japan therein of the German rights and claims to the sacred province of Shantung. Japan's signature to the peace was contingent upon that reservation. Shantung was expressly the *sine qua non* of Japanese adherence to the peace of Versailles. Shantung was the

gist of the twenty-one demands. And yet on September 14, 1922, Japan withdrew from Shantung, handing over everything to the Chinese, in accordance with her Washington pledges, amid the astonished contemplation of the journalists of the world and of the dumbfounded Chinese themselves. Joint administration of the railroad was continued as agreed upon. In this latter case of very material sacrifice the irreconcilables point out that Japan in reality gained in the long run more than she lost in Shantung. A Chinese boycott had crippled her trade in this, one of the richest provinces in the republic, these critics explain, and Japanese policies and ambitions in Shantung were rapidly stirring up a national resentment throughout China. However that may be, the fact remains that the Kato administration has carried out to the letter in Shantung what Admiral Kato signed to do at Washington.

These, then, are the facts. It seems a pity that our own government has failed to enlighten the ignorance of the nation on matters of such vital importance. I do not hesitate to say that such thousands of American citizens as give these interests any thought at all are at this moment wondering whether Japan has been, or is, carrying out her vast naval building program as announced after the war. What a difference in popular sentiment might have occurred, and might still occur, if the true facts had been promptly and widely made known to the public! If our government would spend half the energy in disseminating this healing kind of information that it wastes in creating misapprehensions about its own policy, the whole country would benefit thereby materially and morally. Once upon a time, not so many years ago, the government of the United States was a professed believer in open diplomacy. I am told that those times have changed. I begin to believe that they have changed when I realize that one of the most magnificent opportunities any government ever had has been allowed to slip during the past year.

Possibly the delay in the scrapping of United States ships as provided for and pledged in accordance with the treaty may lie at the bottom of the minimized success of the Washington Conference. Japan's determined course as undertaken by her principal representative at the Conference, Admiral Kato, won for his government a new and wider respect abroad. Japan's subsequent course at home, under the leadership of the same Baron Kato as premier, has been an exhibition not only of good faith but of a national desire to prove to the world that suspicions of the past are no longer justified.

### An Essential Viewpoint

Now with regard also to the very important question of Japanese and American interests in China, the situation is somewhat improved. The idea of the partition of China, which hung like a cloud on the horizon of two generations of Japanese growth, I regard as having been dissipated, if not forever, then for our own times, by the great war. During these same generations and longer the United States, innocent of territorial ambitions, has been the proverbial friend of China, and American sympathies have been pro-Chinese rather than pro-Japanese. Perhaps, however, we are appreciating now a little more readily than formerly the Japanese point of view. Although to-day the open door, brought into general recognition and pledged at the Washington Conference of 1921, is, with the Monroe doctrine, the only definitely expressed foreign policy of the United States, we can now recognize that there is a real necessity to Japan of the markets and the raw products of that part of the Chinese mainland contiguous to her island shores. Here, then, is another valid reason, a generous and a sensible reason, for altering or abandoning the old-fashioned habit of mind.

On the final point and the most delicate, the question of Japanese immigration and property-owning in the United States, it is difficult to write without arousing unreasoning passions on one side or on both. So far as Americans are concerned, it must be admitted that, as a whole, they honestly believe—and in this belief they are at one with the people of Australasia and Canada—that the mingling of white with oriental blood on an extensive scale is harmful to our future citizenship. This belief extends to and affects not only the Japanese, as a race, but other oriental peoples of acknowledged dignity and integrity, such as the Chinese, the natives of the Philippines and the Hindus of India. As a corollary of this conviction, Americans object to the holding of large amounts of real property, of land, by aliens or by those descended from mixed marriages. Frankly, they do not want non-assimilable immigrants as citizens, nor do they desire any extensive proprietorship of land without citizenship.

But the reverse of the position thus taken holds equally true. In other words, I do not believe that the American people now or in the future will insist upon the right or privilege of entry into an oriental country to such an extent as to threaten racial purity or to jeopardize the land-owning prerogatives of citizenship. I think I may sincerely claim for American public opinion in this respect an honest adherence to the Golden Rule. Surely the people of the East will come to realize that we ask of them on their side of the great water no more favorable rule, we expect no lighter restrictions, than we demand in regard to our native sand. Whether this tendency, this reciprocity of thought and policy, shall be expressed in the future through "gentlemen's agreements" or by treaties, it seems to me evident that the atmosphere is slowly clearing and that in this respect also we shall have cause to eliminate another threat to international comity.

### The Question of Commerce

Are there any remaining causes of probable offense which might justify a continuance of the old attitude? Yes, one other must be taken into consideration—commercial rivalry in the Pacific. A certain school of international thought has exalted this as the basic cause of all armed conflicts between nations. With this school I most profoundly disagree. Some wars, undeniably, have in large measure been the result of commercial competition. But others have been based upon racial antipathy and still others on pure military aggrandizement, on religious bigotry or on internal revolution. No general rule that will stand analysis can be applied. During the past hundred and ten years, for instance, the United States has been in many respects Great Britain's most serious commercial competitor. Yet these rival nations look back on a record of unbroken peace during all that time.

In the case of Japan it is true that we shall continue to overlap and perhaps to clash in the development of the commerce of the Pacific, but when one considers the potential trade of the vast territories and huge populations bordering the North and South Pacific oceans there would seem to be enough commercial room and to spare for both Japan and us well into the indefinite future. If it is proved that within one great nation co-operation rather than cut-throat competition best fosters an honorable and mutually beneficial trade, why is not the same formula true as between two nations operating in the same broad area? Europe is providing abundant and impressive examples of the contrary. More specifically, reciprocal markets between Japan and the United States appeal to business communities on both sides of the Pacific. Our trade with Japan alone last year was larger than that with all the rest of the oriental field combined. Furthermore, in the great staples of American export, in oil and cotton and tobacco, Japan is not now and will not conceivably become a serious competitor. In manufactured goods, especially the cheaper varieties, Japan, with preferential rates, a subsidized merchant marine and the shorter haul over government-owned lines, has an undoubted advantage on the contiguous mainland of China. But the higher grades of American manufactures continue to hold their own in markets where the Chinese buy for value. Stiff competition in the foreign field will benefit our inflated standards of profit and bring about a more careful study of foreign markets as well as more elastic adaptation to them.

Finally, I believe that we may assume the principal causes of friction in the past either to have been removed or to be on the road to eventual elimination. That status alone, however, is not sufficient. Things cannot remain merely negative. If we eliminate the habit of mind of the past something else, some other habit of mind, must take its place. Therein lies a magnificent opportunity. The United States and Japan came through the world war in better physical and economic condition than any others of the great powers. Their loss in man-power was relatively very small. Their gain in potential world markets and in home resources was correspondingly great. Their national debts, though materially increased, were in part taken care of by their growth in national wealth. In both countries currency and national credit have remained sound. Both nations are solvent. Most of the rest of the civilized world has been hard hit. Whole populations have been thrown out of gear. To-day the school of those who believe that the solvent nations, those who are in a position to help restore the world, must play their magnanimous part, is almost daily receiving accessions of strength. Whether it be from a purely selfish desire for additional

(Continued on page 445)

# “That Lytton Report”

THE Lytton report to the League of Nations on the conflict in Asia is superficial, ill-informed and, probably, unintentionally, dishonest. If the real aim of the Commission of Inquiry was “to contribute toward a final and fundamental solution” of the controversy over Manchuria, then its effort has been a failure. It has blinked realities, or it has been incapable of digesting the facts of an intricately complex situation. As a piece of writing it can rank fairly with the familiar sort of literary product of the six weeks’ tourist in China. It misses beginnings; it ignores essential details and, as the London press truthfully says, it gets nowhere. With regard to China it perpetuates an ancient sophistry with the same old diplomatically correct, time-worn, hackneyed phrasing. It shrinks from crude actualities. The chimera of profit from trade with four hundred million persists in its mental approach and it fails to appreciate that seventy-five per cent of the four hundred million are at the point of starvation, a burden on the backs of the remaining twenty-five per cent. It has hurt nobody’s feelings, for it has handled the situation with mittens lined with asbestos. As the German press sums it, it is “conglomeration of phrases.” It is, when all is said, a futile, unimportant document.

The task that the Commission of Inquiry undertook was most extraordinarily difficult. Before the Commission had completed its labors, and before its report was published, the task was rendered impossible. This was foreshadowed clearly when the Commission made its second and final visit to Tokyo in July. It is not set forth in the Commission’s findings, but it is reported authoritatively that before the Commission made its July visit to Tokyo it had been apprised of what would be China’s minimum demands. The

Commission probably went to Tokyo with a belief that a solution of the controversy was in sight and that an agreement, to which both sides would give assent, would crown its labors with success. This hope was shattered rudely when Count Uchida, the Japanese Foreign Minister, replied to all suggestions with the statement that the Japanese Government was convinced that recognition of Manchukuo as a new state, separate and apart from China, was the only means of stabilizing conditions in Manchuria and of establishing a condition of permanent peace in the Far East. The Japanese position then was set forth unmistakably and the anticipation that the Commission might bring about an adjustment of the trouble was dissipated.

## Opposition on All Sides

The result, in the form of the report, is something to which neither side will agree. It is true that a special committee of the

Nanking Government after protracted discussion has decided to “accept the report in principle,” noting at the same time mistakes which, it is alleged, the Commission made. Leaders of the Canton régime and also spokesmen in Peiping denounce the report, as do also the leading Chinese newspapers. So far as reports from abroad have been received they record a considerable division of opinion regarding the Lytton report in newspapers overseas. Japanese public opinion and Japanese newspapers are unanimous in rejecting the report.

What the Japanese Government intends to do has been very definitely set forth in the utterances of her statesmen. What the League of Nations will do or can do is problematical. The reshaping of Japanese diplomatic practice at this juncture, as foreshadowed by Yosuke Matsuoka, Japan’s Chief Delegate to the approaching League meeting, assuredly does not imply any intention of yielding to pressure at Geneva or elsewhere. What can the League of Nations do?

It is scarcely warranted here to recapitulate in detail the finding of the Lytton report which has been set forth in summarized form adequately in the daily press. In the opening chapter outlining recent developments in China it is suggested that the nation is making real progress in the direction of taking form as a stable modern state. The League will have to take notice of the circumstance of the virtual secession again of Canton, the warfare in Shantung, the situation with regard to the Chinese Soviet régime in the area of the middle Yangtze, the renewed warfare in Szechuan where, within the period of twenty years 477 civil wars have been fought, and the dubious attitude of the northern Chinese under leadership of that sterling old patriot Feng Yu-hsiang, Yen Hsi-shan and

others. It is implied in an article of the Nine Power treaty that China is to reduce her armed forces, but in the ten years since this treaty has been operative China’s armies, regular and irregular, have trebled. In an article in *Current History* for October on “America’s Far Eastern Diplomacy” Tyler Dennett, Professor of International Relations at Princeton University, describes China’s internal condition to-day saying: “When the Washington Conference was in session ten years ago the Chinese Government was merely a straw man created for the occasion in Washington and set up at the table to fill an otherwise vacant chair. The Chinese Government to-day is no better; it is a fortuitous concourse of unrelated atoms which changes from week to week.”

The second chapter of the report seeks to establish that Manchuria is an integral part of China. Is it? Historians disagree, but there is no disagreement about the fact that Pu Yi, who was despoiled of his birthright in China, is the heir of the Manchus.



Manchuria Which Forms the Subject of the Report

Why did China build the Great Wall? And even if it is accepted that Manchuria was an integral part of China, in the cause of simple accuracy it would have been appropriate to have mentioned in the report, as was not done, the matter of the Li-Lobanoff secret treaty by the terms of which China gave Manchuria to Russia to enable Russia to crush Japan.

Implications set forth in the third chapter seem to take the Chinese position of challenging Japan's rights in Manchuria under the treaties of 1905 and 1915. This goes to the basic cause of the conflict, but adopts the Chinese contentions without any special examination of Japan's side of the controversy.

### "Self-Defense" At Length Defined

In the fourth chapter the Commission rashly attempts to place an interpretation upon an action coming within purview of the terms of the Kellogg-Briand treaty—the factor of self-defense. No ruling upon the question of what may or may not be legitimate self-defense by a power has ever yet been given by the League, by the World Court or by any other national or international organization. The weight of authorities on international law in this connection would seem to give some justification to the action that Japan took. To quote one: Mr. Charles Cheney Hyde, in a recent work on international law, a work which Chief Justice Charles Evans Hughes of the Supreme Court of the United States says is a lasting credit to the American bar, sums up the principle in the following words:

"It is subversive of justice among nations that any state should, in the exercise of its own freedom of action, directly endanger the peace and safety of any other which has done no wrong. Upon such an occurrence the state which is menaced is free to act. For the moment it is justified in disregarding the political independence of the aggressor and in so doing it may be guided by the requirements of its own defense.... It is not, therefore the broad ground of self-preservation, but the narrower yet firmer basis of one form of self-preservation, that of self-defense, on which the justification rests."

Chapter five of the report is devoted to the matter of the conflict at Shanghai and presents no particular conclusions beyond stating effects of this conflict upon the situation in Manchuria. Immediate causes in Shanghai that led up to the outbreak are not described in the report.

In chapter six the Commission takes issue with one of the major contentions of the Tokyo Government saying that the existing régime in Manchukuo "cannot be considered to have been called into existence by a genuine and spontaneous independence movement." This, it is true, is the Chinese viewpoint pure and simple, but it remains to be established. Earlier in the chapter the Commission's report says: "It is clear that the Independence movement had never been heard of in Manchuria before September, 1931, and was only made possible by the presence of Japanese troops." Is the revolt of Kuo Sung-lin against Chang Tso-lin in 1925 then forgotten? This, it may be remembered, measured into a bit a stern fighting which ended with the execution of the leader of the revolt and his luckless wife, and their frozen bodies lay publicly exposed for days in Mukden as a deterrent to others who might have revolutionary tendencies.

Assertions and conclusions of the Commission in chapter seven of the report, in which the boycott movement is reviewed, will meet with emphatic Chinese objections. The boycott is seen as an ancient institution in the Commission's report, but "controlled and directed by organizations which can start or call them off, and they are enforced by methods which certainly amount to intimidation." The report describes illegal methods followed in Chinese boycotts and adds: "In the opinion of the Commission the Chinese Government is responsible for not having sufficiently suppressed acts of this kind."

### Other Points Overlooked

Chapter eight of the report is devoted to economic interests in Manchuria which are analyzed in some detail. In connection with Japanese immigration into the territory the report overlooks the point that the Japanese really have never had the opportunity to settle in Manchuria in accordance with privileges accorded under terms of the 1915 treaty, because the Chinese have never been willing to recognize this treaty and its terms giving Japanese the right to own and lease land in Manchuria were outlawed from the start by the military oligarchy of the Changs.

Chapters nine and ten of the report are devoted to conclusions and recommendations with an attempt to outline principles to be followed in attaining an adjustment of the controversy. To illustrate briefly just how hopeless the suggestions offered really are let us quote one of the major premises of the Commission set forth in chapter nine of the Report:

"Since the present political instability in China is an obstacle to friendship with Japan and an anxiety to the rest of the world, as the maintenance of peace in the Far East is a matter of international concern; and since the conditions enumerated above cannot be fulfilled without a strong Central Government in China, the final requisite for a satisfactory solution is temporary international co-operation in the internal reconstruction of China, as suggested by the late Dr. Sun Yat-sen."

This one trenchant paragraph buried in the hundred thousand words of the report may prove a straw for the League to grasp at in the dilemma that now confronts it, for what the Commission meant in this revealing paragraph, which it was too tender-hearted to say, is what many foreign observers have come to believe is a necessity, if ever a semblance of order is to be achieved in China. And this, simply, is—foreign intervention. Conceivably, some form of Japanese assent might be won for a program of this kind, but every Chinese leader in the land would have hysterics at the bare mention of such an idea.

The League has been blundering from the start of the trouble in the Far East and its leaders realize this to-day. In the beginning, after the Japanese had made the attack in Mukden, in September of last year, it was still merely a local incident. If at that time Chiang Kai-shek had jumped into his wonderful tri-motored airplane and had flown to Mukden to act there as the spokesman of his government, his act would have won the admiration of the world, his person would have been safer than it has ever been in Nanking, and he would have been received with respect. Then China would have won all she is asking to-day, and more. The Shanghai conflict would never have taken place, and the new State of Manchukuo would never have been formed. What happened? Alfred Sze at Geneva put on his famous act, reminiscent of the "last mad ravings of John McCullough." His frenzy communicated itself to the members of the League and that institution immediately took fire and began to revolve like pyrotechnic pin-wheel. The saner leaders had all they could do to bring back a semblance of control of the situation. It was Japan who wisely suggested a breathing space and the Commission of Inquiry was nominated. The Commission has reported and its report is destined for oblivion.

Another report that will live, though, and which would have served better than all the hundred thousand words of the document than has gone forward to Geneva, was that initial statement voiced in Shanghai by the Chairman of the Commission, Lord Lytton, when he said: "The League expects that its members shall have peace in their hearts and not only in their mouths. It is not possible for any nation to cultivate hatred and hostility towards other countries and then expect the League to step in and save them from the consequences of that attitude."—val

### Shall We Trust Japan?

(Continued from page 443)

prosperity, or whether it rise from the deep belief that we owe a little something to mankind as a whole, the demand for the quieting of the troubled waters is heard on every side.

Shall the United States enter upon this great task for mankind? If we say "Yes", we must ask further: "Shall we undertake this mission alone? Is it too big for us? Can any one else help?" It is a task of the first magnitude; of such magnitude that ordinary political gentry stand back appalled. If we accept their ostrich point of view, we shall never begin, we shall never highly dare. We shall miss our great opportunity. But it would seem to be a matter of common sense that, if we once do devote ourselves to this work, we should call in all the assistance available. It is a world undertaking. South America ought to help and, in the light of the Pan-American Congress at Santiago, will help; the British colonies should lend a hand. And why, in all reason, should not Japan, shoulder to shoulder with us, provide her aid as well? If, instead of looking for causes of offense, we in all good faith confidently expect from Japan co-operation in world upbuilding, we shall go far toward insuring peace.

# Washington, Geneva and The Far East

**T**HE American nation, after all is said and done, can only look upon the Lytton report, impartially—as a bystander. American interests, in the final analysis, can only be concerned about what the League of Nations may do with the Lytton report to the extent of the impingement of League action upon American affairs. Beyond this fixed point the American Government cannot and will not go, for this is the recorded will of the American people.

Perhaps no human being in all the long range of world history ever aspired so greatly as did President Woodrow Wilson. He believed that he saw at hand a day when he would guide the American nation into a position in which it would be the leader of a super state which would rule the whole world. It was an ambition that, strangely, China helped to shatter, for China through instruments under Chinese control played an important rôle in the drama that was enacted in 1919 in the American Senate when this body rejected the Versailles Treaty. And so, Wilson, in his grief and despair, went to his death. His was a dream too perfect for an imperfect and crassly practical world, but it is a vision that persists to-day in the minds of his disciples and in the hallowed places, remote from mundane realities, of the theorists and the white-garbed idealists who require nothing short of perfection from an incurably wicked world.

We have, therefore, at Washington to-day a Secretary of State given to letters and oratory who is the mouthpiece of an Administration that will not build warcraft and will not strengthen the armament of the nation, but persists needlessly in a course most surely calculated to produce a situation that can be controlled only with the fullest exertion of these forces.

It is an extraordinary thing, obvious in the columns of the American press, that the great American people, sorely perplexed and preoccupied with their own grave domestic problems, and indifferent to, if not ignorant of controversies in far-off Asia, are quite unaware of the state of mind Japan is in, or of the mounting temperature of national resentment against the United States in the Empire of Nippon. It is doubtless true that public sentiment in Japan with regard to the United States is based upon a misconception and a mistaken belief, and public sentiment in the United States with regard to Japan is to a great extent non-existent, or blithely unconcerned. It is simply the truth, nevertheless, that a large proportion of the people of Japan look upon the United States as something more than a potential enemy and believes that the American people actually desire to see Japan crushed. This is far from the truth, of course, but this is what very many Japanese believe.

The dwellers in the islands of Nippon are a most compact people and they are highly literate. Their great newspapers and their numerous lesser publications compare wholly favorably with the foremost printed organs of publicity in other parts of the world. So when the spokesman of a powerful government overseas adopts what to them is a threatening tone in dealing with their one most vital problem, their interest and concern instantly is whipped to fever heat.

## The Effect in Nippon

Any experienced American newspaper man will agree that only an infinitesimal portion of the newspaper reading public in the United States struggled through the labored periods of the address Secretary of State Stimson gave before the Council of Foreign Relations in New York, or through the letter Secretary Stimson addressed to Senator Borah. One prominent American editorial writer confessed frankly in his column that he regarded the reading of the New York address as a form of drudgery to which he yielded only because he was under orders to write an editorial for his paper on the subject. He unconsciously exactly expressed the American viewpoint—indifference. But the vast reading public in Japan devoured avidly every word of what Secretary Stimson said in New York and what he wrote in the Borah letter, and along with these the Japanese public read and digested the mass of editorial comment, for the most part inimical to the United States, that was served up to them in their papers. These

expressions from the American Secretary of State became the subject of excited discussions throughout the whole country and American prestige in Japanese eyes and American friendship in Japanese hearts suffered in consequence. What was the gain for the United States?

To any observer of Far Eastern affairs the reason for all this is apparent. The Japanese are a proud people with a sense of patriotism that passes ordinary bounds and the high quality of their courage has been tested by fire. With a population mounting at the rate of approximately a million a year and with egress eastward or southward barred against them, they believe implicitly that their whole destiny as a nation depends upon the solution of the problem in Manchuria. This is a question before which all differences of opinion or viewpoint in Japan, political, religious and social, vanish, and upon which the whole people stand as a unit. Defeat of their aims means to them extinction as a nation—suicide. With such beliefs what would Americans do in like case? Is it suggested that if confronted by great odds with a danger seen as a menace to the very life of their nation Americans would rely on "the moral force of world opinion?"

While the American navy has been shrinking to parity with that of Japan it is apparent that American diplomacy has neither been "treading gently" nor has it been "carrying a big stick." In the Far East its idea appears to have been to turn an infant loose with a six-shooter in a dynamo room and then throw bricks at the switch-board, letting all the insurance lapse in the meantime. The whole trend of American diplomatic action in recent times, in fact, appears to have a direction truly Wilsonian and in certain exalted circles in the United States it seems evident that the dicta of Washington and Jefferson are out of date. Certainly, Geneva has been having a deadly allure for Washington. The lodge room of the "Mystic Order of The Far East" is located over there in Switzerland and they've elected Uncle Sam the "Grand Exalted Savior of the Universe," as Herbert Johnson most aptly put it recently in one of his famous cartoons in the *Saturday Evening Post*.

## Is the U.S. A League Member?

The United States is not a member of the League of Nations—is the belief in the United States—but one finds as a member of the Lytton Commission of Inquiry that distinguished American soldier, Gen. Frank R. McCoy, high ranking American army officer, detached for special duty with the Lytton commission on order of President Hoover. Why? That is what the puzzled American citizen may well ask, for he can see this as another small link forged between the United States and the League, although General McCoy while travelling with the Lytton Commission as a member sought to emphasize that he did not represent the American Government officially as a member of the Commission. Whom does President Hoover represent?

The reader is familiar with the notes to Japan from Washington and the correlated action at Geneva marking the progress of the controversy in the Far East. Again the American citizen may ask, "Why did we have to get into that?" In several of his expressions and particularly in his New York speech Secretary of State Stimson directly linked up the Kellogg Pact, over which Mr. Stimson has assumed world leadership with the silent and uncast votes of the other sixty-one signatories to the Pact, with the Covenant of the League. The United States as the leading force behind the Kellogg Pact thus again comes into juxtaposition with the League of Nations. And again, the baffled American citizen may want to know, "What does he want to do that for?" In his New York speech Mr. Stimson also put special emphasis on the logical necessity for "consultative action" whenever an international fire alarm rings in any part of the world. "Who do you have to consult with? asks the curious American citizen.

Any consultation necessarily must be with other powers, signatories to the Kellogg Pact, members also of the League of Nations, with whose Covenant the United States already has established contact through the rear door agency of the Kellogg

Pact. To American and other upholders of the Wilsonian tradition, lovers of the League, the Kellogg Pact, in fact, is serving as a most useful instrument to nullify the American popular will. As set forth by Mr. Stimson in his New York speech it would seem that this Kellogg-Briand Treaty is being used as a parachute gently to drop the American nation first into the morass of European politics and then into the further entanglement of the Far Eastern quagmire. Anon will be forgotten and held as a dead letter the verdict of the American electorate in 1920 and 1924. The United States can then take its place as a full fledged member of the League and, in consequence of the votes at Geneva of Haiti and China and Latvia and Liberia and the others, the world may look upon the spectacle of legions of American doughboys marching overseas to safeguard the borders of Liechtenstein.

### Something is Going to Click

The American public, it is true, knows little and cares less about the controversy in the Far East where the major dangers lurk, but presently this situation in the Far East must become a main preoccupation of the League of Nations when the Lytton report goes in. The United States cannot well consistently keep out of it and, surely, no one will believe that the Washington Administration with its present leadership in foreign affairs will want to keep out of it. It may be expected then that the mystified American citizen will get the answer to all of his questions, for while admittedly he doesn't yet understand much about the Far Eastern question, he is extremely well informed about the League of Nations and all that it implies, because twice in the past he has had to give judgment in the matter of the League. A large part of the American electorate hold the naive belief that they decided this League question long ago. When they discover the error, which must happen soon, something is going to click. Then will come into play the whole force of the traditions of the eighteenth century, traditions that have grown through the years to be a tenet of the real American faith. Probably the circumstance that this force already has begun to be exerted may explain why as these lines are being written the gambling odds in New York are eight to five that Franklin D. Roosevelt will be the next President and that Herbert Hoover will be defeated.

The rock upon which the hopes of Woodrow Wilson were wrecked is to be found in the Republican platform, to which the American electorate in 1920 gave unqualified assent, and in words that to-day seem almost to have been prophetic. This particular pronouncement declared that the Covenant of the League "contains stipulations, not only intolerable for an independent people, but certain to produce the injustice, hostility, and controversy among nations which it proposed to prevent."

While illustrating the mutability of party doctrines in American politics it seems also an astonishing thing in the presidential campaign of this year in the United States that the Republican party has found itself thrust into a position very nearly parallelling the position of the Democratic party thirteen years ago, which brought defeat to the Democrats, not only in the campaign of 1920, but also in the campaign four years later. The positions of the two parties, in fact, between the campaign of the 1920 election and that of this year have been exactly reversed. The pronouncements of Secretary of State Stimson implying support for and co-operation with the League of Nations have had the effect of making the Hoover Administration and its election platform pro-League in complexion while the Democratic candidate, Franklin D. Roosevelt, who was formerly an advocate of the League, now definitely is opposed to American participation. It is only fair to set forth Governor Roosevelt's explanation of his change of viewpoint. In a recent address he said :

"In common with millions of my fellow-countrymen, I worked and spoke in 1920 in behalf of American participation in a League of Nations conceived in the highest spirit of world friendship for the great object of preventing a return of world war. For that course I have no apology to make.

"If to-day I believed that the same or even similar factors entered into the argument, I would still favor America's entry into the League; and I would go so far as to seek to win over the overwhelming opposition which exists in this country to-day. But the League of Nations to-day is not the League conceived by Woodrow Wilson. It might have been had the United States joined. Too often, through these years its

major function has been not the broad overwhelming purpose of world peace, but rather a mere meeting place for the political discussion of strictly European political national difficulties. In these the United States should have no part. American participation in the League would not serve the highest purpose of the prevention of war and a settlement of international difficulties in accordance with fundamental American ideals. Because of these facts, therefore, I do not favor American participation."

### Election Possibilities

It is seen, therefore, that national groups cling to illusions, even when these seem outworn, and that American political parties in briefly spun cycles change their viewpoints and doctrines. It is possible, to be sure, but it is unlikely, that the Ides of November in the United States will bring a tremendous overturn of public sentiment with regard to the League and that inborn traditions of the nation will be abandoned. Such a development would usher in a new era in American national life which would enshrine the "Hoover doctrine" in a definite, fixed place in the scheme of things at Washington, and it would profoundly modify the policy and attitude of the American Administration in its foreign relations in every part of the world.

In the election campaign in the United States and in the utterances of the candidates but scant heed has been given to foreign affairs. Probably leaders of both parties see this as a dangerous subject to be avoided. It could be argued that it would not be the course of wisdom for President Hoover to give any special emphasis to the circumstance that his administration has been marching more and more closely in step with the League. This might imply too much and offer a point of attack along lines that led to the downfall of Democratic aspirations in preceding elections. Democratic leaders perhaps have seen a form of inconsistency calculated to befuddle voters in any open onslaught against the Hoover Administration's flirtation with Geneva.

If the Republican Administration should be returned to power it is to be expected that the foreign policies that have been followed through recent months will be continued, but it is likely, too, that a cabinet reorganization will take place, and in the internal party trading, with a wary eye on the Senate, important changes would probably be deemed advisable. If a change in the Administration takes place and the Democratic candidate is elected, the Republican régime will have to mark time, for it will be powerless in its closing days to commit the Government to any major changes. A complete change of foreign policy next year could then be expected and if in connection with this things should go badly in Europe with a recalcitrant Germany and Italy, then it is decidedly within range of possibility that the League of Nations might find itself obliged to close up shop.—val.

### Rail to Girdle World

Singapore, of Far Eastern British naval base fame, cumbers the toe of the Malay Peninsula. It is also at the end of a chain of railways which covers the peninsula, but little more. In opening the new terminal station there, from which one may now travel *via* Prai to Bangkok, the capital of Siam, Sir Cecil Clementi, Governor of the Straits Settlements, beheld a vision which he interpreted as follows :

"We have taken the little step to the little station at Bangkok opposite the historic island of Penang, another would take us into Indo-China, another across China to Manchuria, and there we are on the trans-Siberian railway; or, stepping off in another direction from Bangkok, we touch Burma, Assam, India, Baluchistan, Persia, Iraq, Turkey and Dover." He continued :

"In order that the system to the English Channel should be completed comparatively little remains to be done. The missing links are, first, the sections between Prachuab, in Siam, and Ye, which is the southern end of the Burma railway system; secondly, the section between Burma and Assam; and thirdly, the link between Baluchistan and Basra, at the head of the Persian Gulf. From there the chain is continuous already, except for a short length of eighty miles between Aleppo and Mosul, and a crossing by ferry of the Bosphorus."

# An Expert's Opinion

By BRIG.-GEN. HENRY J. REILLY, O.R.C. Noted Military Expert and Authority on National Defense

**T**HE "Stimson Doctrine," enunciated in the Secretary at State's recent speech and shortly afterwards recognized in Mr. Hoover's acceptance of renomination has thus become the basis of the administration's foreign policy.

Mr. Stimson brought out in his speech that his doctrine, based on the Kellogg pact, replaces our past foreign policy. In other words, it is a clean break with the foreign policy which began under George Washington, was strengthened under such Presidents as Andrew Jackson, Grover Cleveland and Theodore Roosevelt.

Their policy, now discarded, was non-interference in foreign affairs when vital American interests were not concerned, plus insistence on respect for American rights through peaceful means if possible, but by armed force if necessary.

Jackson brought France to terms without war. Cleveland settled the Venezuelan dispute with Britain on our terms. Roosevelt protected our rights under the "open door" policy in the Far East. All showed they were ready to use armed force. None had to do so.

## Settlement

The new policy now substituted will insure, it is claimed, the peaceful settlement of international disputes by mobilizing world public opinion against the aggressor. As a corollary, public opinion being relied upon instead of force, disarmament naturally follows. According to Mr. Stimson "The only limitation to the broad covenant (in the Kellogg Pact) against war is the right of self-defense."

What are the facts as shown by the history of the three years' existence of the Kellogg Pact. How far does this history show that the new policy:—

1. Keeps us out of dangerous foreign affairs which do not directly concern us?
2. Settles international disputes peacefully?
3. Is recognized by other nations as furnishing sufficient security with the result that they have decreased their armaments to the extent practiced by our own Administration?

The facts are as follows:

The first is that war anywhere, including all of Europe, Asia and Africa, now becomes our business.

The second is that international disputes have not been settled on the basis of judicial determination of guilt as called for by Mr. Stimson, but, just as formerly, on the basis of the stronger nation militarily telling the weaker what it must do and the weaker complying.

The third is that the disarmed nation, though potentially stronger because of greatly superior area and population, has had to bow to the potentially weaker, but much more strongly armed nation, showing that armament is essential to security.

The fourth is that through the virtual abolition of neutrality called for by the Stimson doctrine, once war does come, signers of the Kellogg Pact cannot keep out.

The best proof that wars in Europe, Asia and Africa now become our business are the following words of Mr. Stimson:

"Another consequence which follows this development of the Briand-Kellogg Pact which I have been describing, is that consultation between the signatories of the pact, when faced with the threat of its violation, becomes inevitable." Following this, we led in intervening between Russia and China in 1929. We began doing the same in the Chinese-Japanese armed conflict over Manchuria and are still doing it.

Under our old policy, our Presidents steered clear of the French and British wars of the French Revolutionary and Napoleonic period until its last phase, 1812-15. They kept entirely out of the numerous European wars from that date until the great war of 1914-18—the Chino-Japanese War of 1894-95; the Russo-Japanese War of 1904-5, and the South African War of 1899-1902.

Mr. Stimson's endeavor to settle peacefully the Chinese-Russian armed conflict in the summer of 1929 led to our being publicly rebuffed in a Russian statement so strong as to have easily become the first step in a diplomatic exchange terminating in war.

## Discovery

The conflict was settled by China's discovering that Russia was too strong for her militarily, and also that persistence in her course would quickly lead to Japan's armed intervention against her.

Furthermore, the recent speech by Viscount Ishii is a polite but unmistakable warning to us that Japan will fight before she yields to any interpretation of the situation other than her present one—the continued occupation of Manchuria.

The Japanese agreement just signed with Russia shows Russia recognizes Japan's superior military strength in Eastern Asia and her determination to use it rather than yield. In the agreement, Russia virtually agreed to all Japan's demands with respect to a long dispute over fisheries which has threatened war several times. Despite Japan's continued occupation of Northern Manchuria, in which Russian rights in so far as treaties are concerned are equivalent to Japan's rights in South Manchuria, Russia is making no protest.

Russia in the Far East and China everywhere are both militarily weaker than Japan. Russia dare not take the greater part of her army away from its present position in Europe facing Poland and Rumania. China has large military forces, but no army in the modern military sense. Neither Russia nor China has a navy.

Japan has a first class modern army and navy, each including a modern air force. She used both to drive China out of Manchuria and Shanghai, which was the boycott headquarters. She has plainly shown China, Russia, ourselves and the League of Nations that she is ready to continue to use them to enforce her will in the Far East, regardless of Mr. Stimson's and the league's opinion as to the legality of her actions under the Kellogg pact.

The long list of diplomatic exchanges, statements by government spokesmen, and records of the league for the past year have proved this conclusively.

Also the press and parliamentary records of this country, Britain, France, Germany, Italy and Latin-America show anything but a general mobilization of public opinion against Japan. They almost show a mobilization of world public opinion against going to war to compel Japan to accept the views of Mr. Stimson or the League.

## Disputes

The Stimson policy calls for the denunciation of one or more of the belligerents as law breakers which, with consultation with other powers is to replace the old "declaration of neutrality," by which, under the old policy we steered clear of wars which did not vitally concern us. Thus, under the new policy, we began immediately disputing with the belligerents, always the first step toward war. This instead of doing so only in those cases in which our rights are violated as was true with France and England prior to 1812 and England and Germany during 1915 and 1916.

The failure of the other powers to accept Mr. Hoover's proposal intended to prevent the recent adjournment of the Geneva disarmament conference without result proves that the other powers did not accept mobilization of opinion against an aggressor under the Kellogg pact as sufficient security for their national interests.

Britain prefers to trust to her dominant navy, Japan wants to increase her navy relative to ours and that of Britain. She intends to keep her army, now dominant in eastern Asia.

How far we are already trusting to the Kellogg pact instead of to armaments is shown by the fact that under Mr. Hoover's proposal we would have to build some ships and greatly increase our regular Army.

# Sustained Advertising for Foreign Business

W. L. BOMER, Vice-President, Bristol-Myers Company

Mr. Bomer, a world-wide advertiser, represented the manufacturer's viewpoint in relation to the advertising problems of international commerce on the occasion of the recent convention of the Advertising Federation of America. In the present article the entire range of the manufacturer's export advertising problems is treated intelligently and frankly.

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**A**DVERTISING to-day is still a potent factor. It still is as inherently sound and necessary in export marketing as the quality of our goods, the aggressiveness of our sales representatives or the intelligence of our management. But it must be controlled—it must be budgeted—it must be intelligently employed.

The successes of the next decade in export will be those who invest their money wisely in export advertising to-day. If we are to make money, however, we must exercise the most careful discrimination in the selection of the places and the manner in which we invest our advertising dollars.

What can we do that our advertising dollars may be expended more profitably, more fruitfully? The first step is to take some of the guesswork out of export advertising—to forsake the trial-and-error method and adopt more of the analytical and fact-finding methods that have been fostered and developed by our domestic brethren. Frankly, on several occasions, I have turned envious eyes to the facts, data, research and services available in the domestic advertising field. Most certainly, it has simplified their problems and the paucity of it in export has confused ours and caused our advertising expenditures to operate at less efficiency.

## Lessons of History

Let me say, however, that I fully realize why export is less favored in this direction than domestic. One has only to review export history for the past decade. The export of American manufactured goods enjoyed a tremendous impetus within the not distant past. In appreciation of the quality of our merchandise, foreign consumers turned to our products, selling representatives clamored for our agencies, and, when appointed, clamored even more vociferously for our advertising. As orders came in, a flood of advertising dollars was released. The export advertising agencies enjoyed a remarkable growth. New ones were born and expanded rapidly. In a comparatively short time the advertising pages of foreign publications were heavy with American advertisements. Then came the depression. The trend was reversed and the decline was perhaps even more rapid than the ascent.

We could not help but learn something from our experience. But, unfortunately, the growth was so fast, the demand on our time so urgent that the opportunity for dispassionately studying our advertising did not exist. If there was a doubt whether paper A was better than paper B, it was easily solved—we used both papers.

We cannot now be so liberal. We must choose between media or other forms of advertising. If there is a choice of papers, we must try to select the one which, from the standpoint of quality of circulation, quantity of circulation and cost, will give us the best return. But it is difficult. Generally speaking, we have no guaranteed circulations, we have no accurate analyses of circulation, we do not know whether the space rate charged is just or otherwise. We must guess at the duplication between the circulation of competitive periodicals.

As a measuring stick the milline rate has been used in this country but it was found not to be a fair basis. It led to many abuses among which I might cite the fact that circulations were inflated to lower the rate. Quality of circulation was sacrificed for quantity. Now in export, other factors would distort the picture. The customs duties on news print stock, ink, presses, etc., vary with each market, likewise transportation costs.

So an international comparison of milline rates is useless. The milline rate is still significant, however, in comparing publications

within a country. But it is only part of the picture. The quality of circulation is equally important. Luxury articles require a different audience than products for the masses. Circulation analysis would help determine this factor. Immediately that we are in a position to know regarding circulation, the answers to what it is, where it is and who it is, it is simple enough to determine whether a rate is justified. Until we have this information, there shall always exist a challenge or at least a doubt of foreign advertising rates.

## A Plea to Publishers

While on the subject of newspapers, let me make a plea to foreign publishers to better the printing and make-up of their advertising pages. Bad make-up can ruin good advertising. Good make-up will strengthen a weak advertisement. Good make-up and strong advertising assure the advertiser his money's worth. It will pay the publisher to give this matter special consideration. Improved make-up will improve advertising, which in turn will improve sales. As sales improve there are few advertisers who will not increase their purchases of space. Thus the publisher should have a very selfish interest to better the make-up of his advertising pages.

Recently, we have had some very bad examples of make-up. In one case, four single column ads were set side by side. In another instance, three competitive ads appeared on the same page and in juxtaposition. Most common of all is to see an entire page composed solidly of advertisements with not a line of news or editorial content to break the monotony. Our small ads have been buried and our large ads poorly printed. This is not, I am thankful to say, a general indictment of all foreign publications. Some have been notable in their efforts to employ good technique in their advertising make-up. There are papers, however, who are continually bad offenders. All publishers cannot help but profit by giving their best attention to this important subject. Let them study the effects of the pyramid make-up so generally used in this country. Surely a betterment in this direction will help both the publisher and the advertiser.

We, as export managers, have often been accused by our advertising agents of being heartless, especially in these days of slashed appropriations. It may appear strange to them, therefore, if I now say a word in their behalf. They are to-day beset by many problems and difficulties. They are obliged to know many things of many markets, widely separated geographically, and with pronounced racial differences and habits. We share their responsibility for the success of our advertising. We export managers can lighten their load by giving them our 100 per cent co-operation. It is incumbent upon all of us to see that the agent is fully informed about our product or products—our selling and merchandising policies. We must keep him posted on our domestic advertising, its background, its results. In other words, I feel we should treat our export advertising agent just as if he were a member of our own organization.

We ourselves should study the domestic advertising of our companies and discuss it with the export advertising agency. Domestic advertising can many times be inexpensively adapted for foreign markets. Mechanical charges in export considered on a percentage basis to space purchased fare very badly when similarly compared to domestic. There is a good reason why they do. In the first place, the cost of space in export publications is considerably less than domestic. It is strikingly significant when we stop to think that while export publications generally charge by the inch or centimeter, domestic publications invariably charge by the smaller unit of the line. One page ad in the *Saturday Evening Post* would provide a year's campaign in some foreign countries. Therefore, it is self-evident that the mechanical charges on a percentage basis to space purchased are apt to be tremendously high if a campaign is especially prepared for export.

### Needless Headaches

Many times the export advertising agent is taxing his ingenuity for a new advertising slant, when a powerful, successful domestic campaign—already paid for by the domestic advertising department—is lying idle begging for new fields to conquer. We, in my department, never hesitate—in fact it is a hard and fast rule of ours—to make use of domestic copy and illustrations if we feel they can be adapted economically and successfully.

As I have always been keenly interested in advertising in all its phases, I look with regret on the imposition in a great many foreign countries of prohibitory tariffs against printed or lithographed advertising material, such as window displays, counter cards, etc. I have always considered dealer help material a powerful adjunct and supplementary effort to our periodical advertising.

To our complement of advertising tools in export has recently been added that of radio. Probably all of us have toyed with the idea of radio advertising campaigns. Some of us have used it. Years ago the Ipana Troubadours serenaded the listening audiences of Cuba and Mexico. Despite this experience, we would like to learn more about radio advertising. We know the names and locations of the stations that are available. Their number is increasing daily. We have some idea from governmental statistics of the number of receiving sets in the various countries. The question on which we crave more information is how can we best utilize these facilities. Herein is a field for intensive study. What types of programs have been and are now successful in foreign markets? What are the racial differences in Latin America or elsewhere for program preference? How can we test radio at a moderate cost?

### Censorship a Problem

And now a word to my contemporaries, especially those who, like myself, are in the proprietary field. All of us have noted with alarm the tendency of foreign countries to censor our advertising. The regulations in some countries to-day are very strict. There are

even cases where it is necessary for us to submit our advertising for the approval of the governmental authorities before it can publicly appear. The unfortunate part of the whole matter is that we have only ourselves to blame for this condition. If, on account of exaggerated claims, this movement gains further strength, it will be a boomerang to American advertising. We have but to keep our advertising honest and credible and there will be no need for governmental censorship. Let us not continue to offend in those countries where no such censorship exists to-day. Contrariwise, let it influence us to see that the need for censorship should never arise.

In my opening remarks, I expressed the belief that we should invest our money in export advertising to-day. In this connection I think that an opportunity presents itself to the American manufacturer to-day such as has never occurred in the lifetime of any of us here present. In many countries, as we know from sad experience, the local currency has depreciated in relation to the American dollar. Moreover, merely a cursory glance through the majority of foreign publications will demonstrate that the volume of advertising running at the present time is very small.

Now, as experienced advertisers, we know that with few exceptions, it takes anywhere from one to three years after beginning an introductory campaign before the sale of the product advertised is on a profitable basis.

Of course, I am no Indian mystic and cannot foretell how long this so-called depression is going to last, but inasmuch as we have already had three years of it, it seems a fair guess that by the end of the next three-year period, we will be well out of it.

In view of these facts, does it not seem a logical thing to do to begin now to advertise in new markets where either previous or present investigations show that our individual products have a possibility of success? Our American dollars will go farther—they will buy more space and the advertisements in that space will stand out in greater prominence. They will not have to compete with the heavy artillery of the huge schedules of past years. Thus your battle for the reader's attention will be more easily won.

## Just Imagine

**I**f the overburdened members of the League of Nations grow weary of the difficult problem of determining what to do in China they may find diversion, relaxation—and, possibly, some inspiration—by shifting their attention to the situation of the United States *vis-à-vis* the sun-kissed Republic of Liberia on the Grain Coast of Africa where the American rubber magnate Harvey Firestone of Akron, Ohio, is trying to grow rubber on a tract of a million lately acquired acres.

The Republic of Liberia is an excrescence of American philanthropy, which was founded in 1822 for the settlement of negro slaves who had been freed in America and who wished to return to their native land. This black Republic, which lies on the Guinea coast of Africa between Sierra Leone (British) on the west and the French colony of the Ivory Coast on the east, remained under the tutelage of the United States for the first quarter century of its history. It declared its independence as a nation in 1847 and was recognized as a sovereign state the following year by Great Britain and by the United States thirteen years later. It became one of the original members of the League of Nations in the year 1920 when the League was established.

The Republic of Liberia now flashes into the current news at Geneva by reason of an American proposal to give to the United States a virtual dictatorship over the Republic. It is suggested by those sponsoring the proposal and vigorously opposed by Liberian interests that the United States appoint a Chief Advisor to take charge of Liberian affairs. The matter was under discussion before a League committee at Geneva in September.

This proposal grows out of a long-continued disordered state of affairs in the Liberian Republic. It was made as the result of a report presented to the League of Nations two years ago by a Commission composed of Dr. Cuthbert Christy, British, representing the League of Nations; Dr. Charles S. Johnson of Fisk University at Nashville, Tennessee, American, and Arthur Barclay, Liberian. The report was replete with testimony of tangled

finances, corrupt administration, slavery and tortures comparable to those of the Spanish inquisition. To change these conditions and to establish peace and order the United States now desires to take control of the affairs of the Republic.

This superficially reasonable proposal would seem to fall within the purview of the Mandates Commission of the League of Nations and, in the event it were accepted, it would have the effect of demoting the Republic of Liberia into the position of a country under League mandate. Liberia, of course, would be rated in such circumstances as a "Class A" mandate.

Under the beneficences of American rule the dusky republic should swiftly float—on rubber bearings—into an era of peace and order. Oppression in all forms would be abolished; corruption would be extirpated; industry would be encouraged, and the nation would thrive. In course of time the Republic should win back to a status in which rightfully it might regain full membership in the League as an independent sovereign state. To do this, however, it would be obliged to conform with certain prerequisites.

These consist of a set of requirements laid down by the Mandates Commission of the League setting forth conditions that must exist in any country formerly ruled under mandate before it may attain to League membership. These requirements are five in number. They follow:

- "The country must have an administration capable of maintaining the regular operation of essential government services.
- "It must be capable of maintaining its territorial integrity.
- "It must be able to maintain the public peace throughout its whole territory.
- "It must have at its disposal adequate financial resources to provide regularly for normal government requirements.
- "It must possess laws and a judicial organization which will afford equal and regular justice to all."—val.

# Report on New Magnetic Steel

Discovered by Dr. T. Mishima, Imperial University, Tokyo

By JAMES A. RABBITT\* and Dr. T. FUJIWARA†

**T**HE M.K. steel, recently discovered by Dr. T. Mishima, is highly magnetic and yet differs in many respects from other magnetic steels. Heretofore, steel containing from 20 to 30 per cent nickel has been known as irreversible steel in which the critical point  $Ac_2.3$ . (the point at which steel loses its magnetism on heating) is several hundred degrees Centigrade higher than  $Ar_2.3$  (the point at which steel regains its magnetism on cooling). A quick cooling of high nickel steel from a high temperature in atmosphere will prevent the  $A_2.3$  transformation of steel, thus keeping it non-magnetic at room temperature.

The authors have ascertained that if an increasing amount of aluminium is added to iron nickel alloys, the  $A_3$  transformation of these alloys is raised, but the slope of the  $A_3$  line will be increased so that the range of concentrations of the irreversible or alpha alloys at room temperature decreases and, in turn, that of the reversible or gamma alloys increases.‡ Thus when about 10 per cent of aluminium was added to about 20 per cent of nickel iron alloy, Dr. Mishima obtained reversible ternary alloys. Figures 1, 2 and 3 show the magnetic change due to temperature variation, Figure 1 being a curve for 20 per cent of nickel iron alloy, Figure 2 for the same alloy with 5 or 6 per cent of aluminium, and Figure 3 for that with 10 per cent of aluminium. In the case of the reversible alloys, he found that not only the residual magnetism

but also the coercive force is much higher than has been heretofore attainable in magnetic steel. The coercive force of M.K. steel is claimed to be 650 gauss, which is approximately nine times that of tungsten steel and  $2\frac{1}{2}$  times that of old cobalt steel. The authors have learned that in the latest K.S. steel (Honda's cobalt steel) the coercive force developed exceeds 500 gauss.§

In order to impart magnetic properties to ordinary magnetic steel, it is necessary to quench the steel so as to produce a hard structure, but in this process there is a risk of creating quenching cracks and strains. This, it is claimed, is particularly objectionable where such steel is subject to high temperature or mechanical shocks.

M. K. steel should be properly annealed after casting to impart a high magnetic property. This, it is claimed, eliminates all difficulties caused by quenching and yet leaves high magnetic quality and great durability.

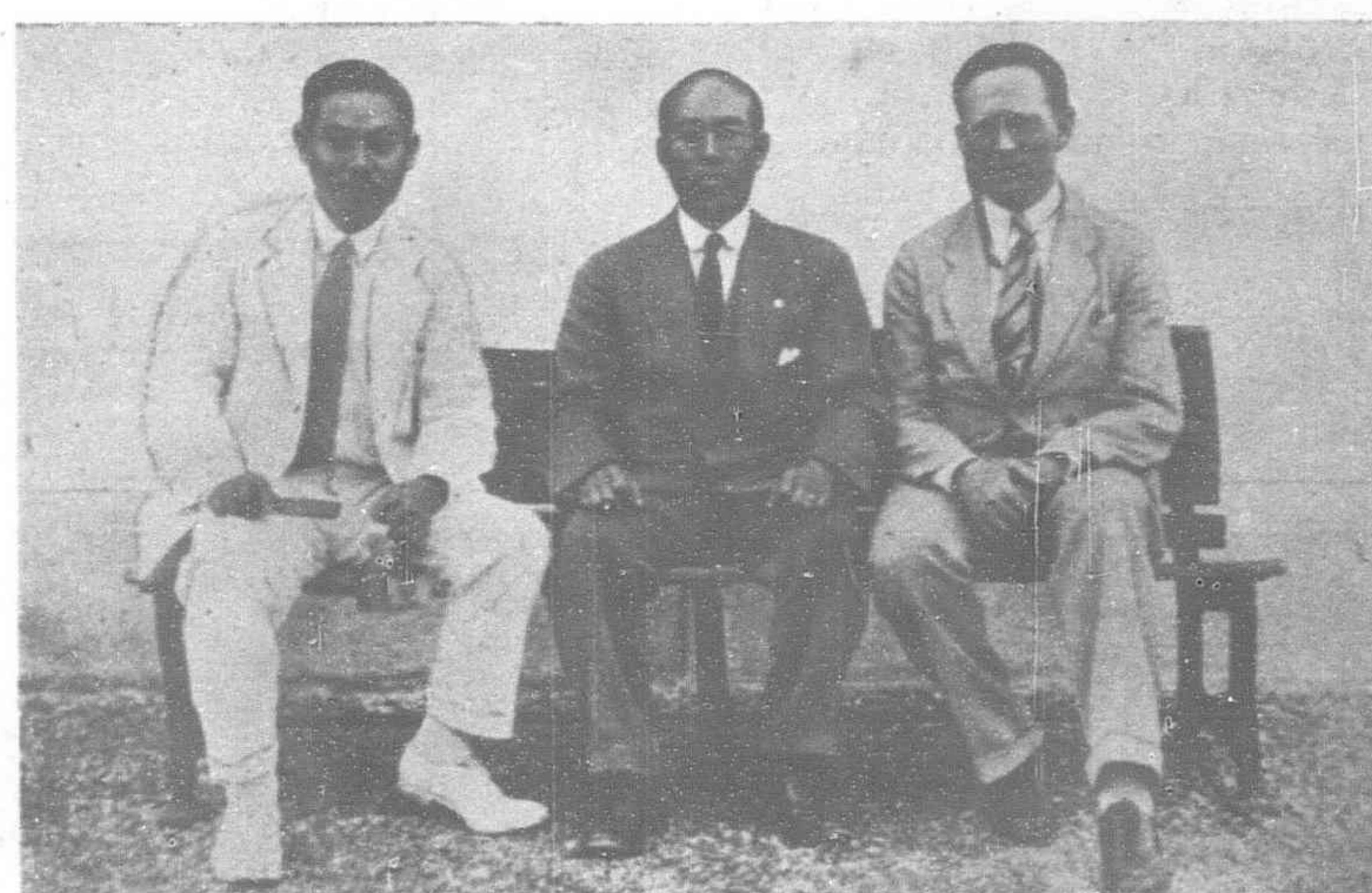
It is claimed further that this steel does not lose its magnetic properties even when the temperature is raised several hundred degrees Centigrade, and it is very stable upon being subjected to strong mechanical vibration or shock.

The particulars given by Dr. Mishima regarding various properties of this steel are as follows :

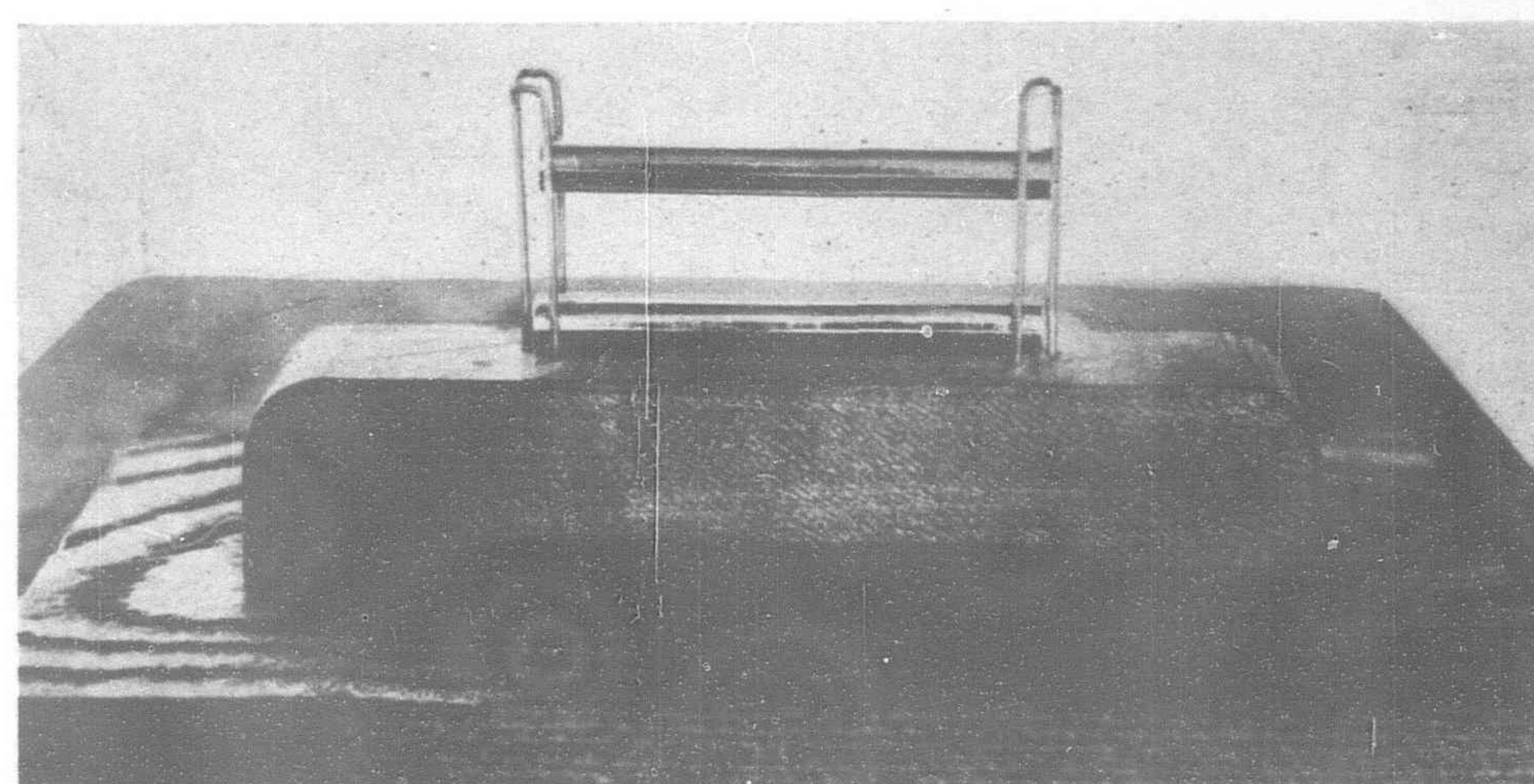
## Residual Magnetism and Coercive Force

The magnetic property of steel can be expressed by two main factors, namely, residual magnetism ( $Br.$ ) and coercive force ( $H_c$ ), which are explained by Figure 5.

When, during the process of magnetization of a piece of steel which is to be determined, the magnetic field is diminished at a point E in the curve of magnetization, the IH curve does not take the same path as EFO but takes another course, such as curve EG, which is quite different from curve EF; hence, if the field is reduced to zero, the magnetization does not vanish. This magnetization OG is called residual magnetism, designated by  $Br.$  in Figure 5. A weak field in the opposite direction is then applied, gradually increasing in intensity, after which the intensity of magnetization gradually diminishes and finally vanishes at a certain value of the field. The magnetic field OH which must be applied in the opposite direction in order to reduce the magnetization to zero



Dr. Mishima (center) with the authors at Tokyo Imperial University, July 22, 1932



Specimens of M.K. Steel showing their high coercive force (The upper specimen is floating in air).

is called the coercive force, shown by  $H_c$  in Figure 5.

The residual magnetism of M.K. steel can be graded between tungsten and cobalt steels, although the coercive force of M.K.

\*Adviser to Japan Nickel Information Bureau.

†Metallurgical Engineer to Japan Nickel Information Bureau :

‡The authors have interviewed Dr. Honda regarding the above and have based their Figure 4 on Figure 114 (showing the critical point concentration curve), Page 110, of *Magnetic Properties of Matter* by Dr. Honda. Dotted lines are added by the authors to conform with tendencies which have been noted by Dr. Honda from his studies.

§The authors have conferred with Dr. Kotaro Honda regarding this point and he stated that :

"It has been established that a ferromagnetic substance which is hard to magnetize has a large coercive force when it is once magnetized by a strong field. Hence it is very important, to obtain a high coercive force, that such a substance should be magnetized by a very strong field amounting to 20 to 30 thousand gausses."

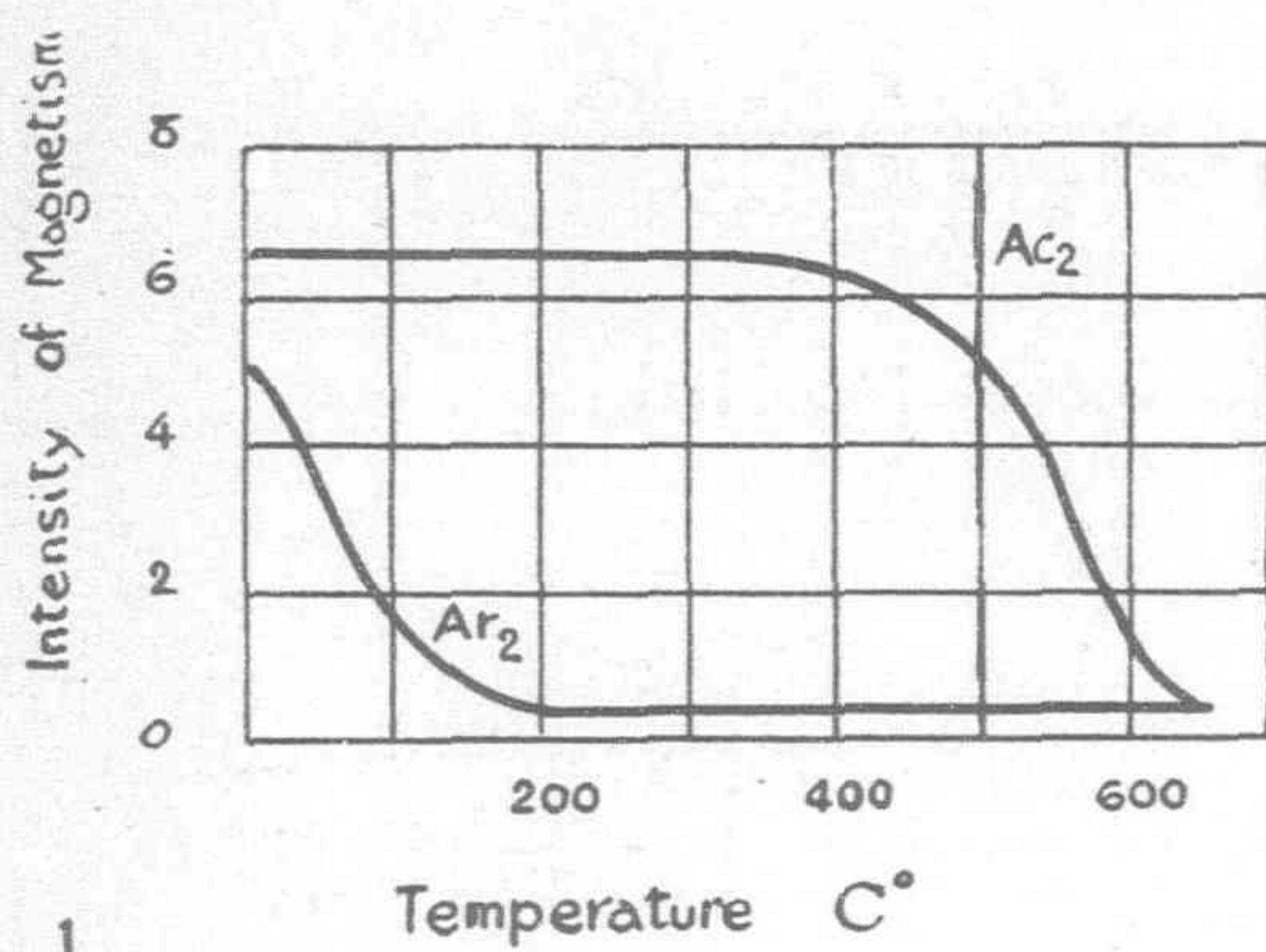


FIG. 1

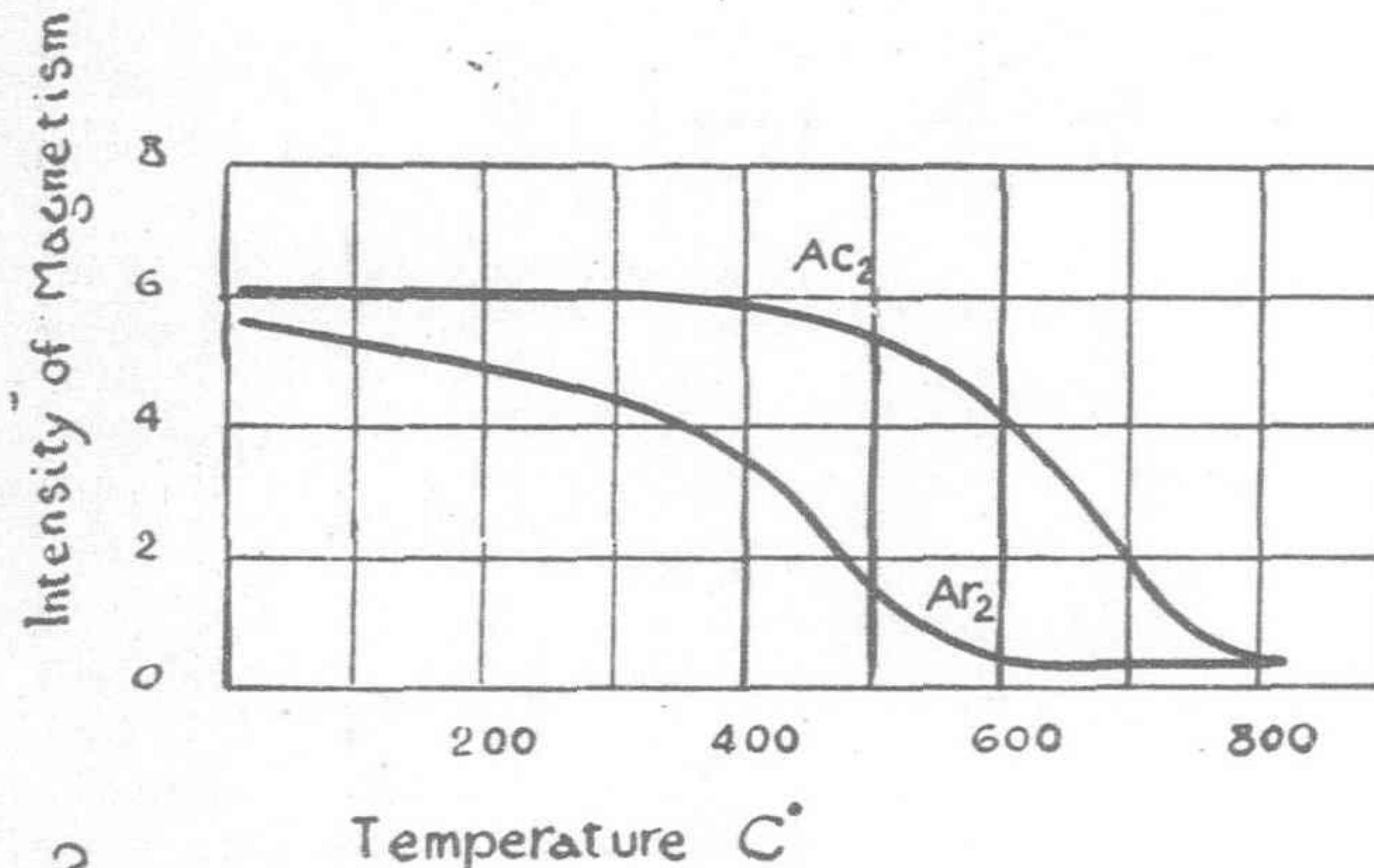


FIG. 2

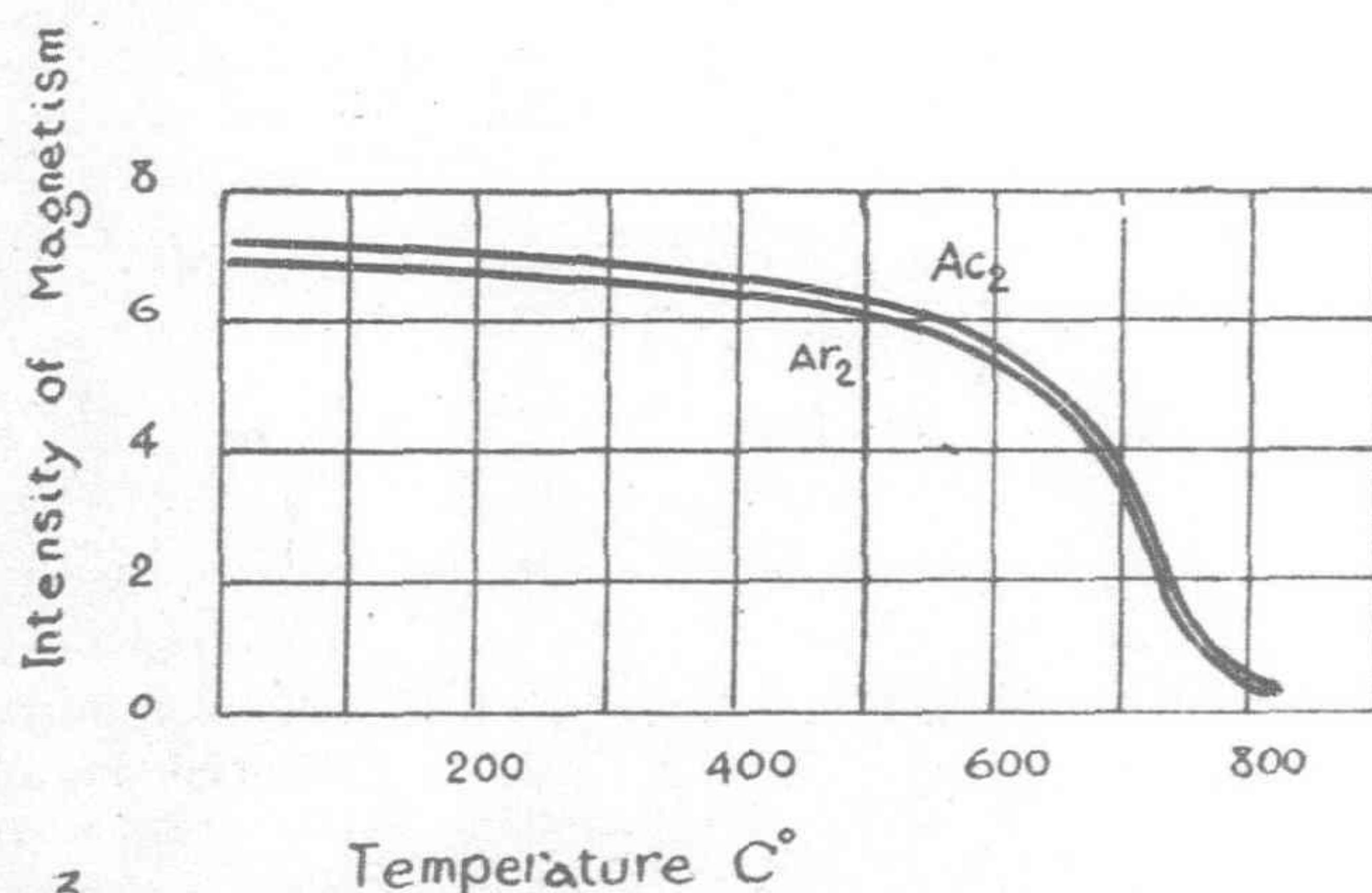


FIG. 3

steel is much greater than in the other two steels, as is shown in Figure 6. From the foregoing, it appears that the coercive force of M.K. steel is about nine times as great as in tungsten steel and  $2\frac{1}{2}$  times as great as in old cobalt steel. In the same figure it is shown that several kinds of magnetic steel of different grades, such as (1), (2), (3), (4) and (5), can be obtained by the addition of various amounts of aluminium.

#### Magnetic Properties of M.K. Steel at High Temperature

The magnetic properties of M.K. steel at a high temperature are illustrated in comparison with tungsten and cobalt steels by Figures 7 and 8.

It is claimed that neither the coercive force nor the residual magnetism of M.K. steel changes markedly as the temperature increases, until  $700^{\circ}\text{C}$ . is reached, at which point they drop very suddenly, while, as will be noted, the same properties in cobalt steel or tungsten steel will commence to drop at a much lower temperature.

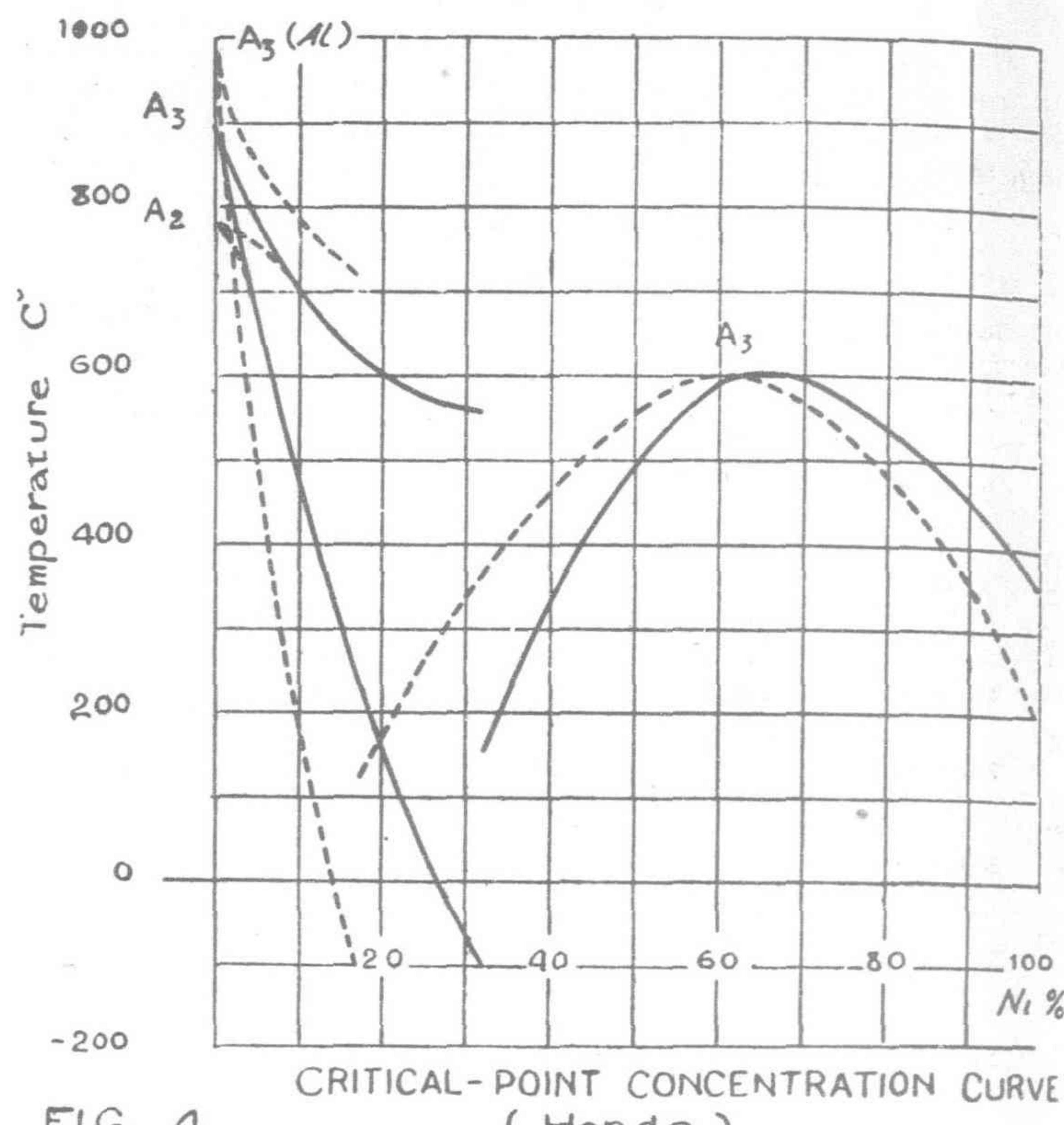


FIG. 4

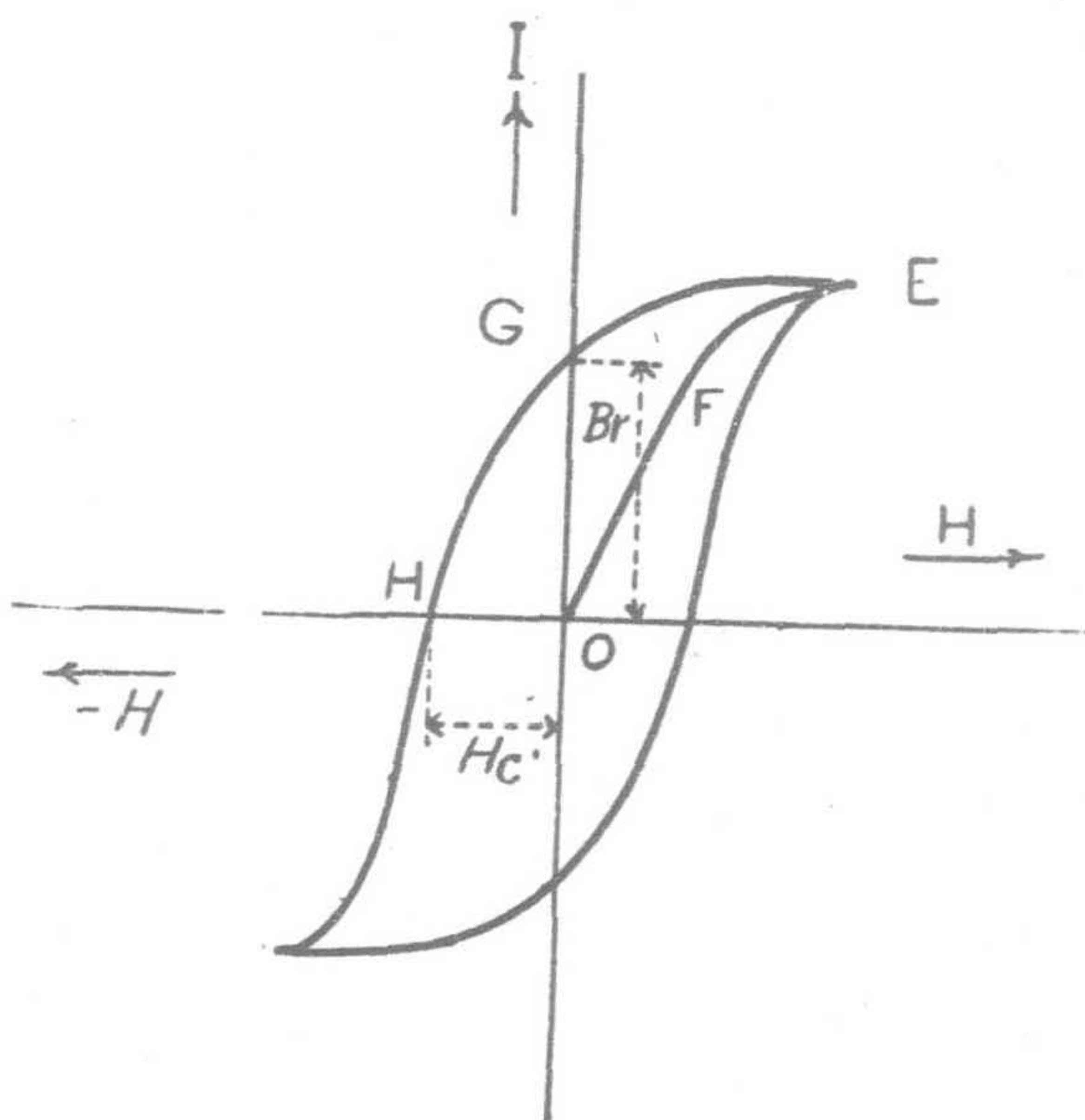
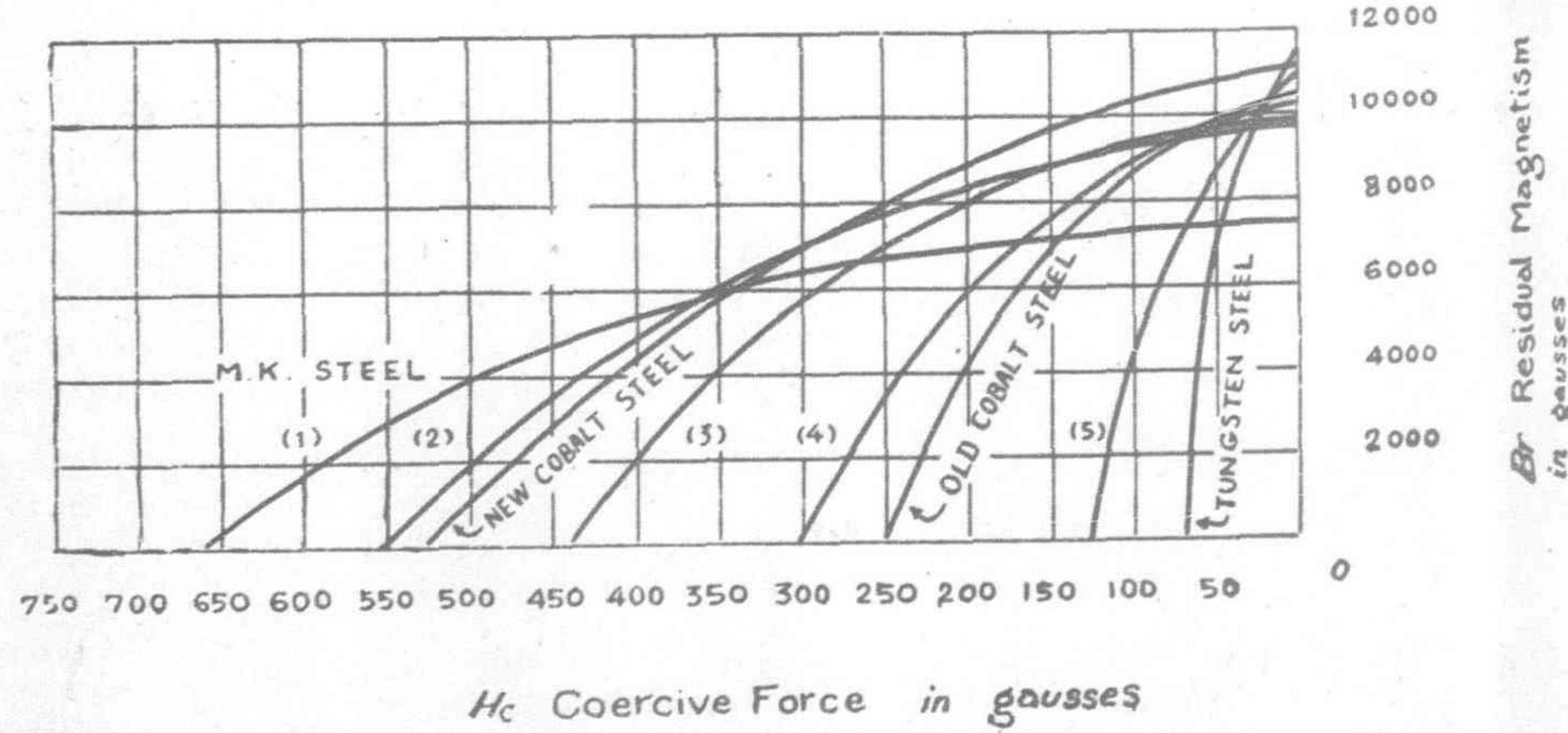


Fig. 5.—Hysteresis Curve of Magnetism



Hc Coercive Force in gauss

FIG. 6

### Shock Test

The magnetic property of M.K. steel when subjected to shock has been determined by comparison with other magnetic steels. This is illustrated by Figure 9. It is evident that the residual magnetism of M.K. steel is not affected by shock.

### Composition of M.K. Steel

M.K. steel consists mainly of three principal elements: namely, iron, nickel and aluminium. The amount of each element in M.K. steel varies widely but nickel ranges from 10 per cent to 40 per cent,

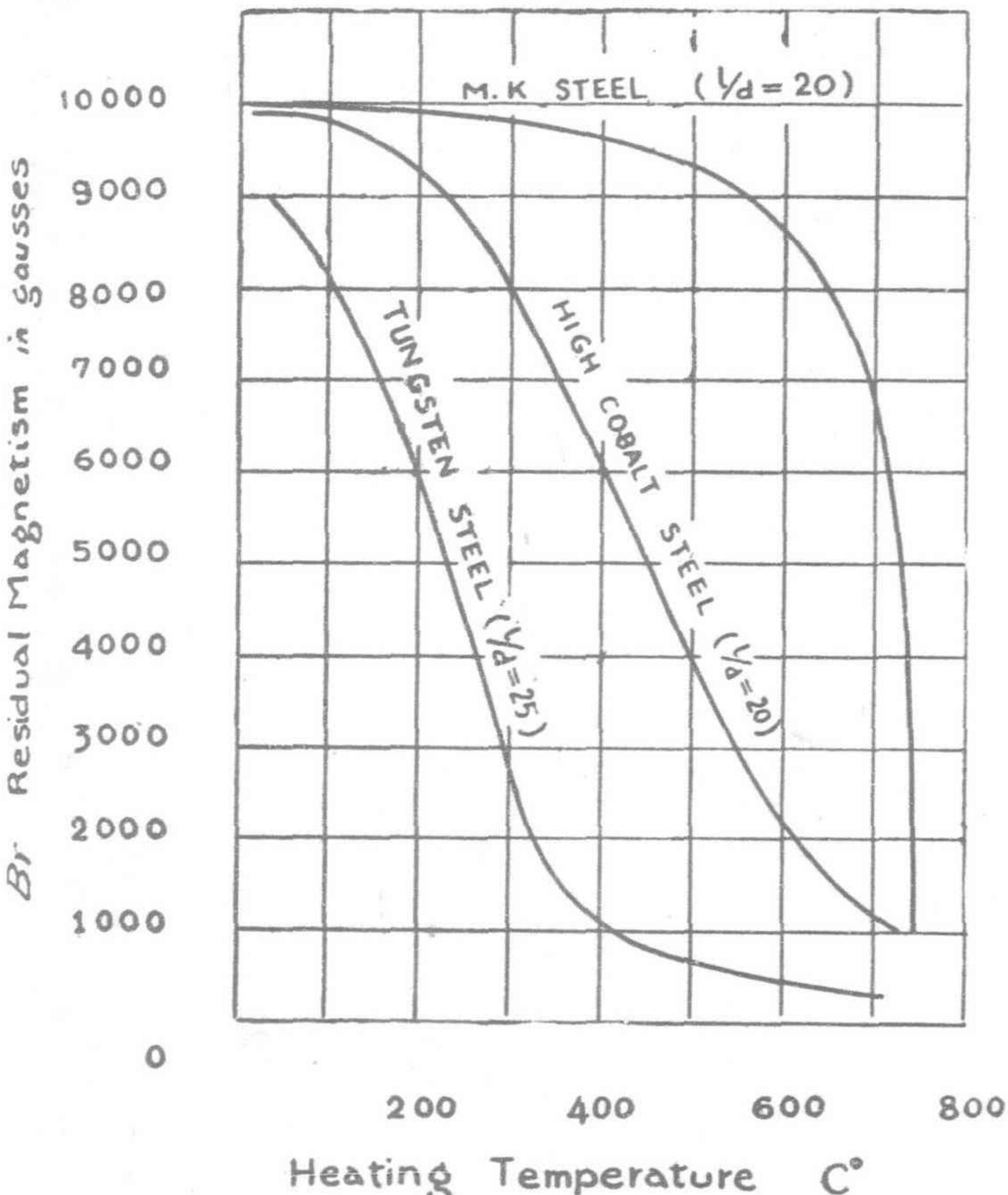


FIG. 7 VARIATION OF RESIDUAL MAGNETISM DUE TO HEATING

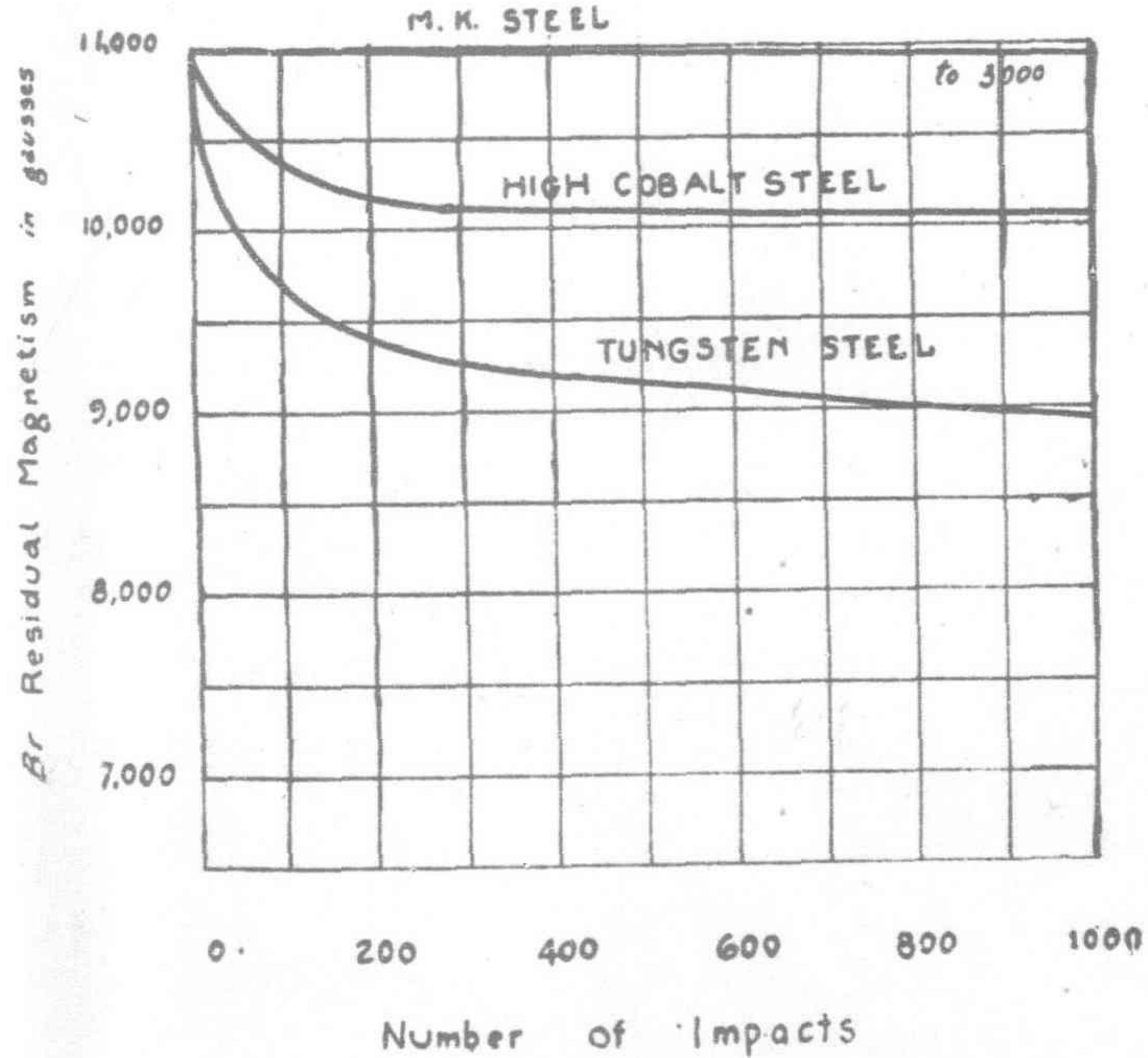
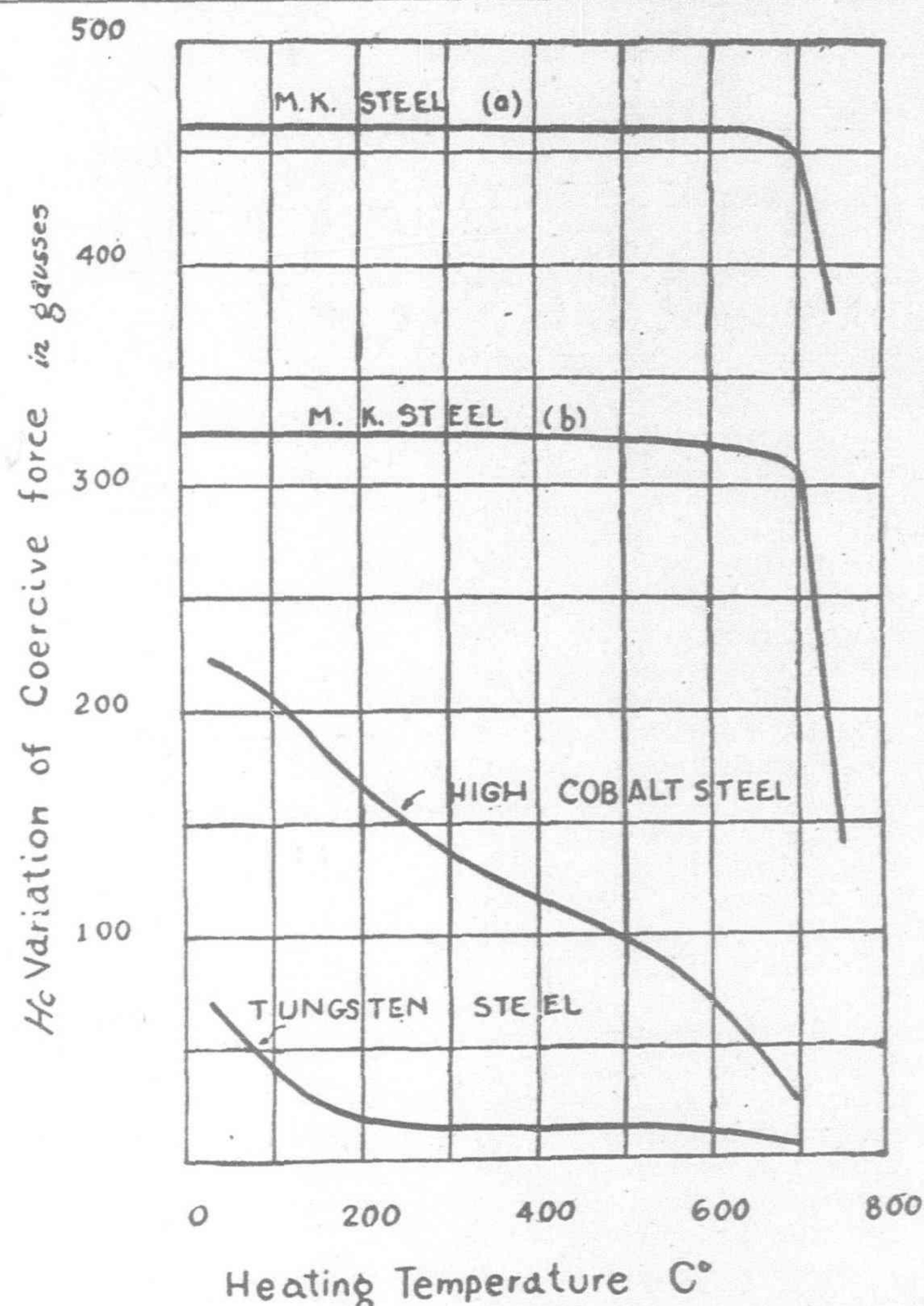


FIG. 9 TEST MADE BY DROPPING A SPECIMEN ONTO A CONCRETE FLOOR FROM A HEIGHT OF 1 METER



VARIATION OF COERCIVE FORCE DUE TO HEATING

while aluminium ranges from 1 per cent to 20 per cent. The best results have been obtained with the following composition:

Nickel, 25 per cent; aluminium, 10 per cent and iron balance.

As already mentioned, by combining these elements a number of grades of magnetic steel can be produced with different Hc or Br values, such as are shown by (1), (2), (3), (4) and (5) in Figure 6.

Unfortunately M.K. steel cannot easily be forged, and hence it is necessary for it to be cast in order to obtain the desired shape. This limits its use to larger articles. However, this steel is light in weight, weighing only 80 to 90 per cent of ordinary magnetic steel. Also its heat resistivity is an important factor in its favor.

### Paper Making in China

Paper making, an ancient hand-operated industry of Foochow, China, has gone modern with the opening of a new mechanically equipped paper mill in that city, according to a report from Vice-Consul Ralph Townsend, Foochow.

The new mill, which is largely equipped with American paper-making machinery, has at present, a daily output of about five and one-half tons of paper, operating with 250 workers it is said. Compared with the largest paper-making establishment in the city operating under the old hand methods, the new plant's daily production is equal to about that of 5,000 hand workers, the report states. The American trained manager of the new mill states that present orders warrant the expansion of the daily capacity to about four times the present output.

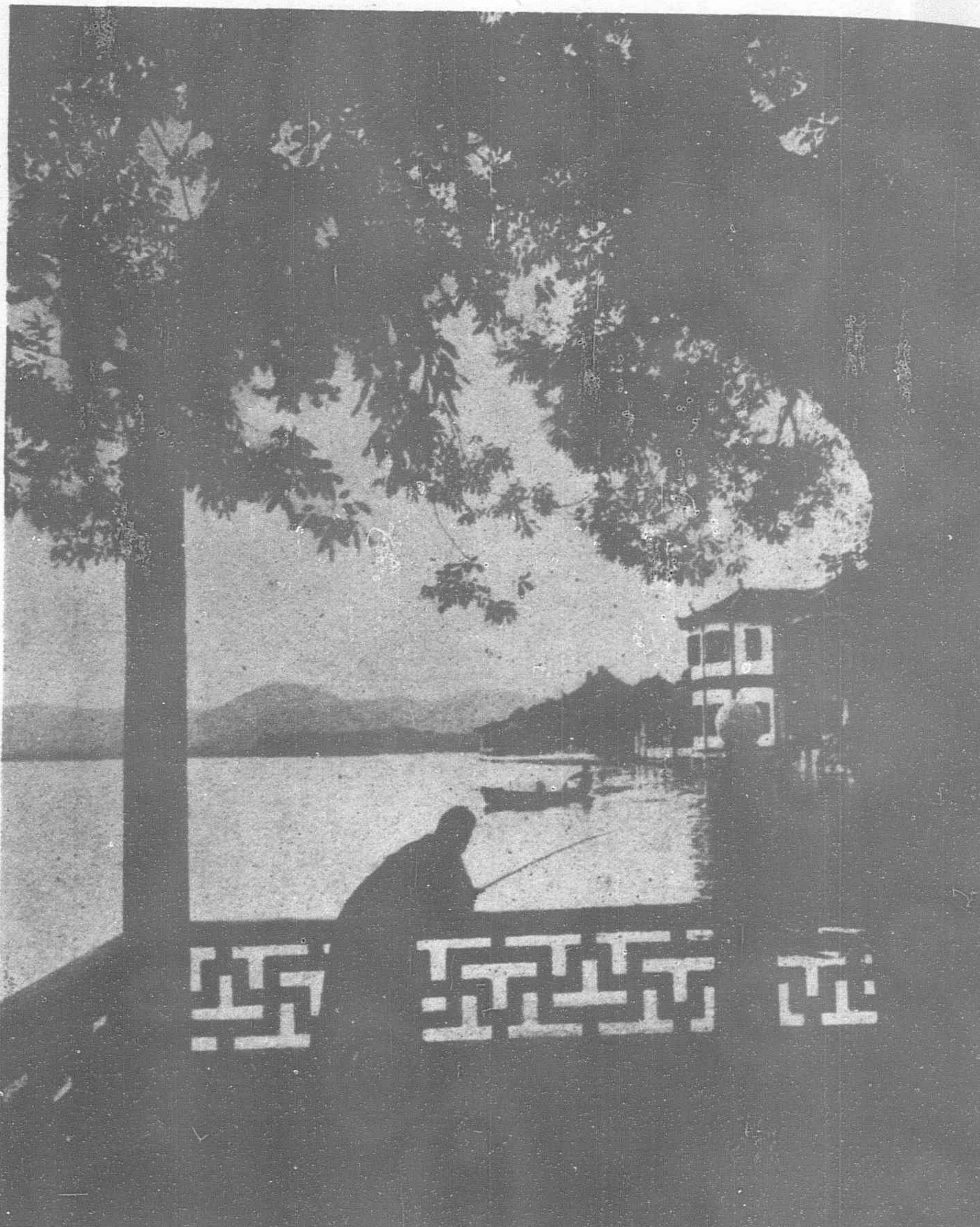
The principal papers being made by the plant at present are, according to the report, writing paper and paper used for the manufacture of Chinese umbrellas and other paper goods used in China. Rice straw and reeds, which have made the province distinctive in the paper industry for centuries, are the chief materials used in the new mill, it is said.—(Department of Commerce).

# New Highway Linking Shanghai and Hangchow Opened for Service

**A**MILESTONE in the progress of road construction in China under the auspices of the National Economic Council is reached with the completion and opening of the 216 kilometers Shanghai-Hangchow highway on October 10. In its program of construction work, the National Economic Council regards the building of a net-work of highways and roads in the country as one of its major activities. To carry out this project, it has established within its organization a Highway Department, secured the collaboration of the Communications Section of the League of Nations and created an initial revolving Road Fund of \$1,000,000.

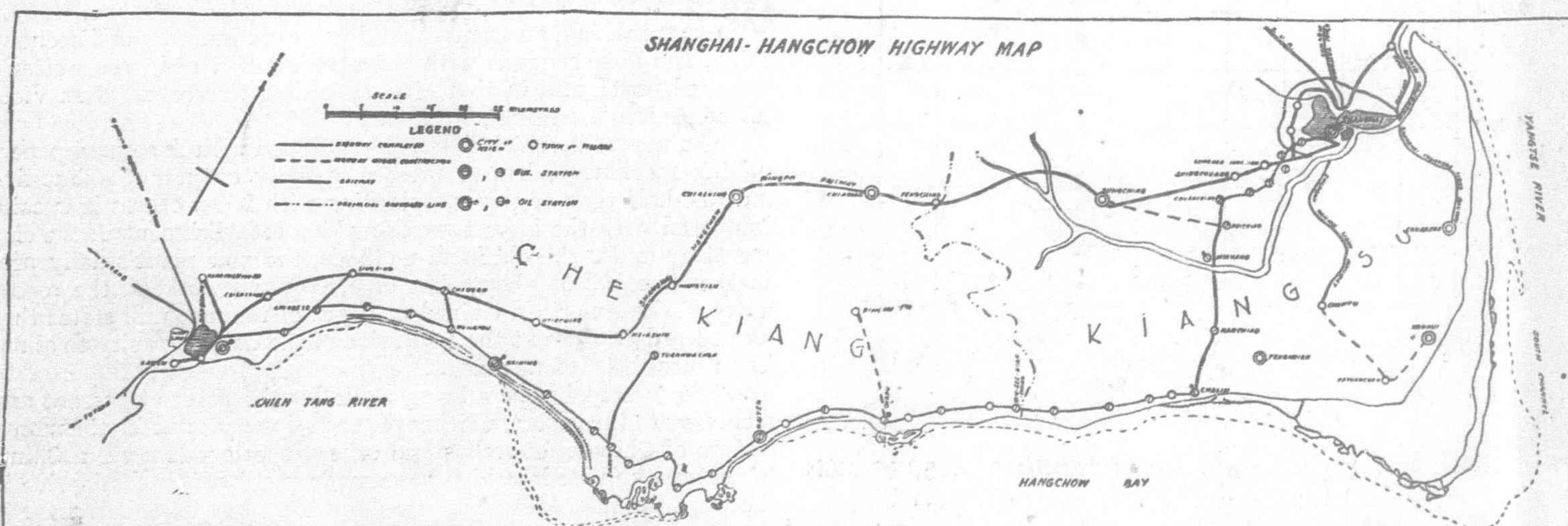
The Highway Department is now manned by a staff of competent Chinese engineers, with large and varied experience in road construction in the different provinces. This staff collaborates in an advisory capacity with the provincial and municipal reconstruction bureaux and engineers who are actually constructing the road. The collaboration of the Communications Section of the League of Nations of which Mr. Robert Haas is director, constitutes a most advantageous arrangement for the Council in the advancement of road building in China. Through it, the Highway Department is furnished with the advice and experience of road-building experts of the League's Communications Section, the first two assigned to this work being Mr. M. S. Okecki and Mr. F. J. M. Bourdrez. Since their arrival in China last year, these experts have done invaluable service, in their advisory capacity, in the construction of the new highways in the Yangtze Provinces. Mr. Haas has also given the Council the benefit of his advice on the problems of development of general communications in the country in the several visits he made to China in the past two years, and is maintaining close contact with the progress of work of the Council.

The question of financing properly the program of road building is no easy problem in view of the limited financial resources of the country. But a good beginning has been made in the creation of the revolving road fund, with which an arrangement has been worked out to give partial financial assistance to the provinces in the construction of inter-provincial roads.



West Lake—Hangchow

The plan provides for a loan of 30 to 40 per cent of the cost of the roads to the provinces, which is paid out gradually to the borrower as the work on the road progresses in accordance with construction specifications laid down by the Highway Department of the Council. It provides also a definite arrangement for the repayment of the loans, so that the Road Fund will be made a revolving fund for further lending in assisting the construction of more roads. Thus under this plan and arrangement, the total road fund of \$1,000,000 of the Council has been lent out to construct five trunk roads, of which the Shanghai-Hangchow Road



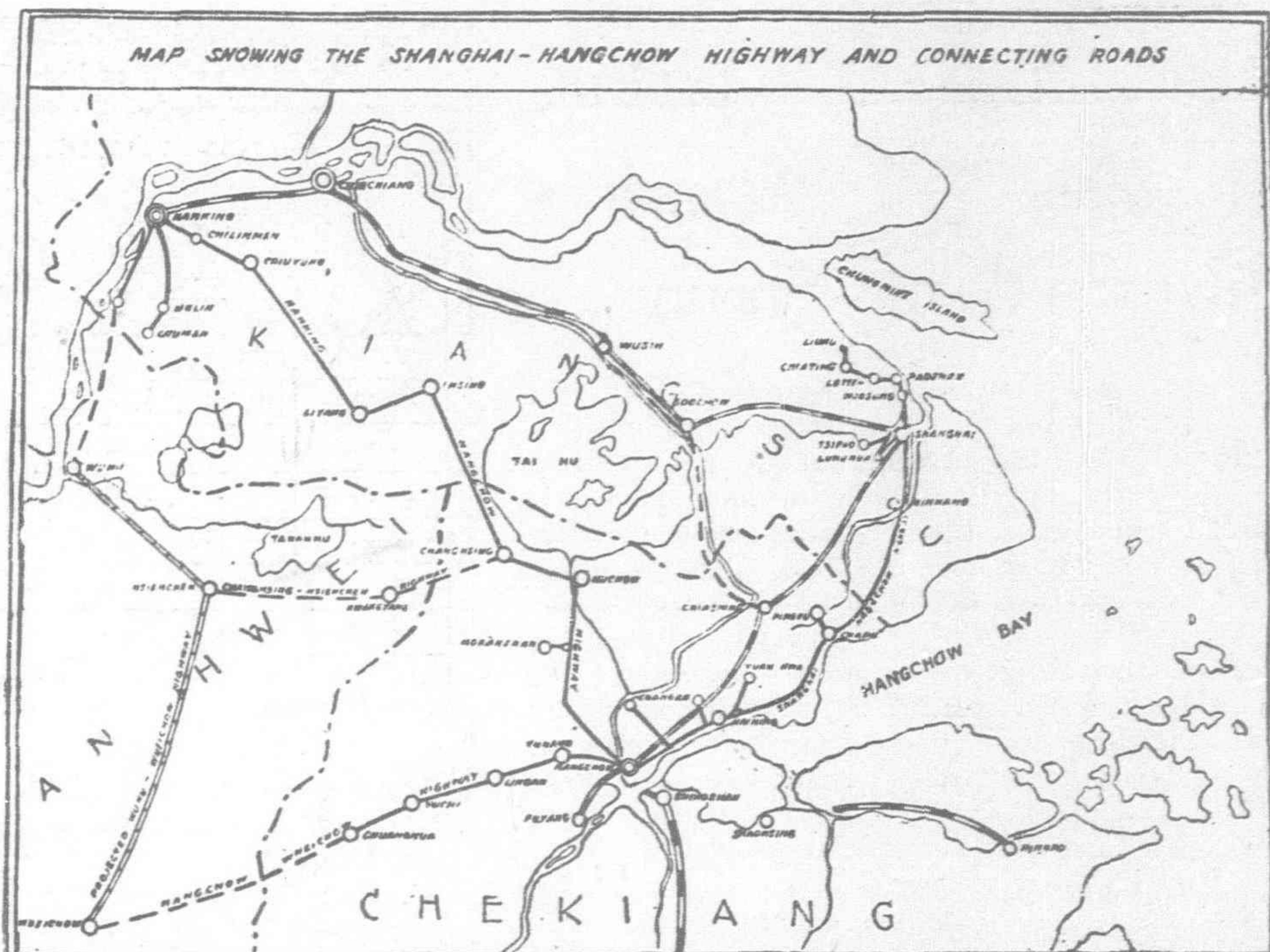
is one. The other four are the Soochow-Kashing Road, the Nanking-Wuhu Road, the Changshing-Suichang Road and the Hangchow-Hweichow Road, which are now under construction.

The completion of this road will link 2,048 kilometers of completed roads with Shanghai, and 320 kilometers under construction thus opening a large territory of the interior to motor and vehicular traffic from this great city.

It may be asked how with such a modest sum is it possible to finance so large portion of the cost of these trunk roads. The answer is that it is the aim of the Council not to build "high-type" roads for luxurious passenger traffic—which would cost at least five times as much as spent on the "Council" roads now being built—but to build cheap roads and more roads for general traffic, suitable for buses and freight traffic. Higher grade road will be built in time, but the main purpose at present is to provide increasing transportation facilities. The Shanghai-Hangchow Road and the other four roads now under construction are only the beginning of these facilities. Yet these roads are so built that they are suitable for motor passenger traffic, and with reasonable maintenance, which is insisted on by the Council, they should be continuously satisfactory for motor traffic. It is expected that the Shanghai-Hangchow Road will attract a considerable amount of travelling by motor between the two cities on the part of the public. This road being a link between the provinces of Kiangsu and Chekiang will assure the collaboration of these two provinces and the two important municipalities for the maintenance and the regulation of traffic of this road, and lead to the increase of communication and commerce between them.

#### Description of the Highway

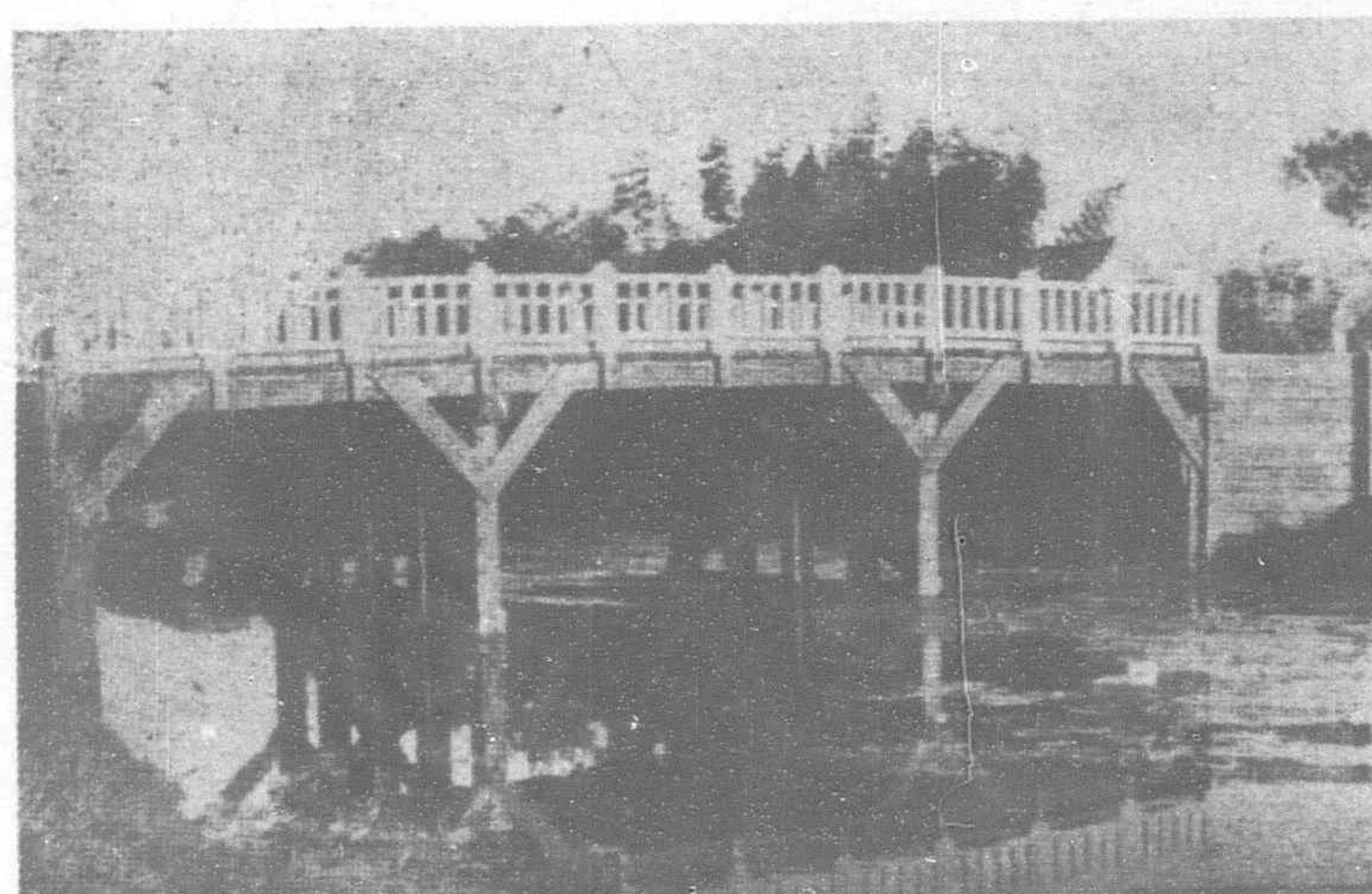
The two adjoining Provinces of Kiangsu and Chekiang constructed several separate sections of this road in the course of the last ten years. But the wide Whangpoo River and the individualistic character of the two Provinces seem to have constituted sufficient barriers to prevent the unification of the road. It is worth while to delve into the history of its construction, and of the administration of the various sections separately.



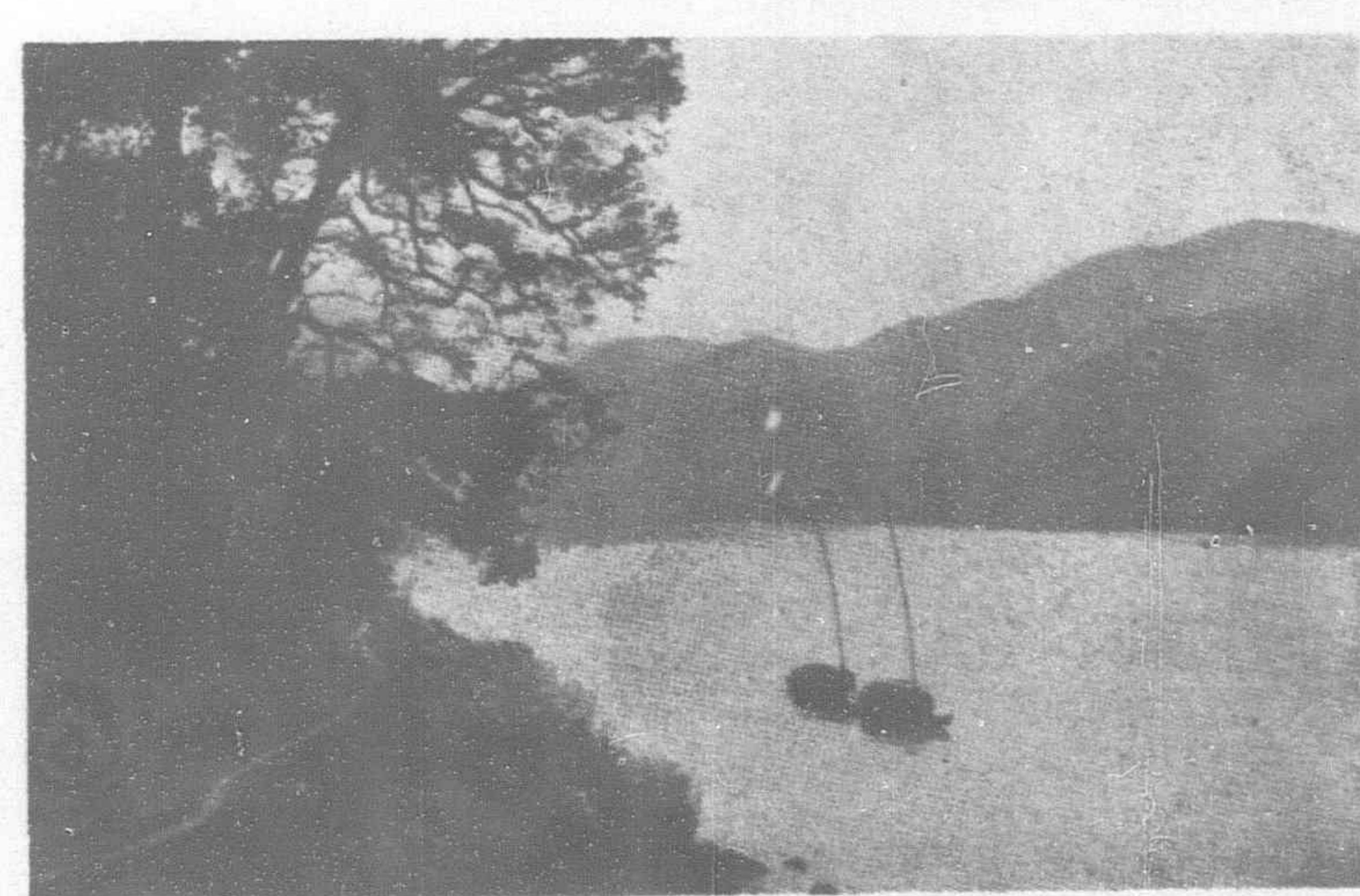
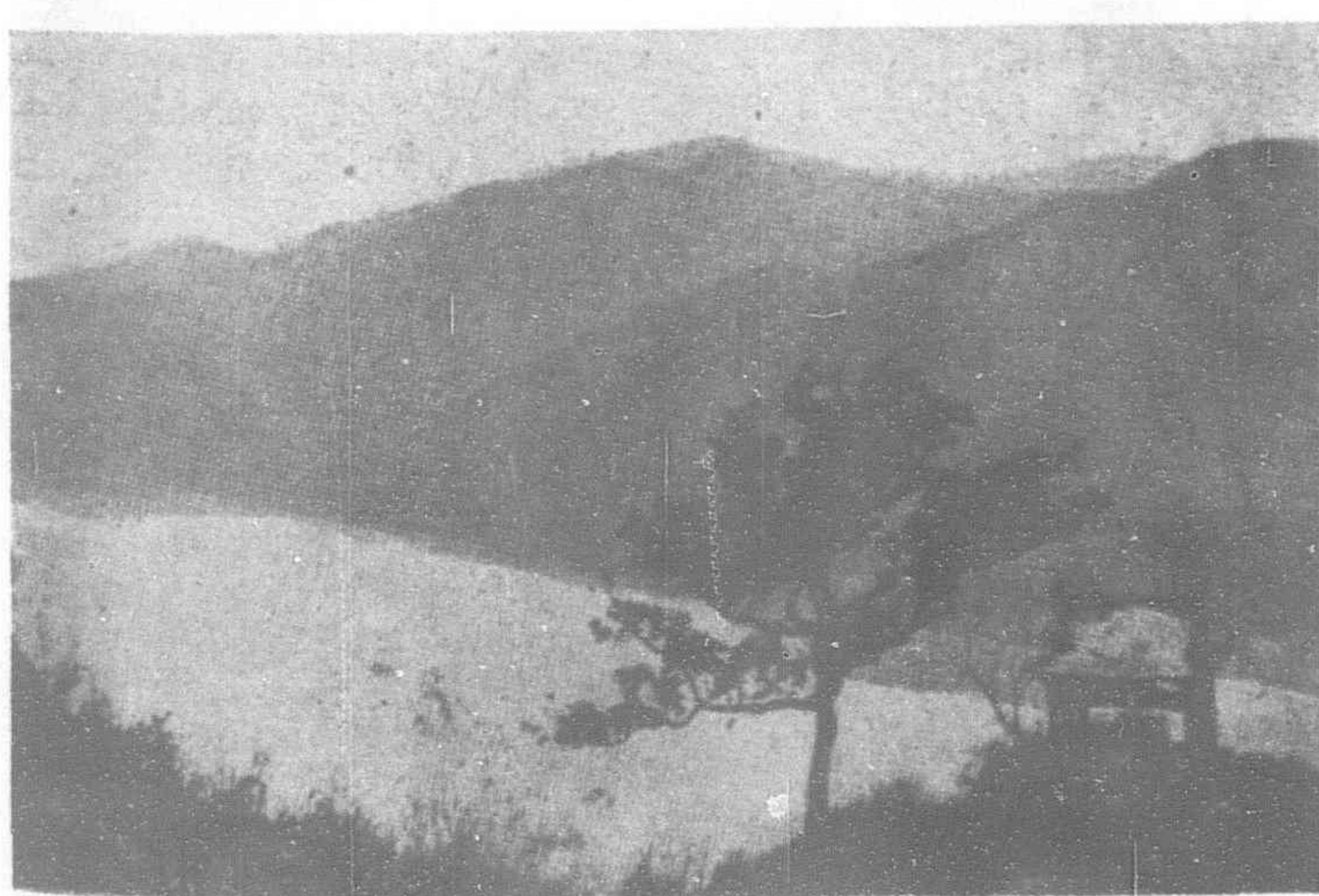
(1). SHANGHAI-MINGHONG SECTION.—Length 29 kilometers. Built of broken bricks and cinders by the Shanghai-Minghong Chalin Motor Bus Company. This omnibus line is in operation with a regular and frequent service, which has been in existence for a long time. Near Tsaohoching there is a toll: after October 10, 1932, private motor-cars are exempt from paying this toll.

(2). THE MINGHONG FERRY.—This whole work has been financed by the National Economic Council. It consists of a jetty, a landing bridge, and a pontoon on each bank of the Whangpoo River, designed by the Greater Shanghai Bureau of Public Works. There is a new steel ferry boat, driven by a Diesel engine, designed by the Greater Shanghai Bureau of Public Utilities, and a wooden ferry boat, operated by manpower. The entire task was started in July and completed at the beginning of October.

When the traffic has sufficiently developed, a bigger ferry



One of the new Bridges—Kiangsu Section



Scenery along the new road near Hangchow

## SHANGHAI-HANGCHOW HIGHWAY DISTANCE SCHEDULE (in kilometers)

KIANGSU	SHANGHAI													
	29.13	MINHANG	⊖											
	30.77	9.64		NANCHIAO	⊖									
	99.40	20.35		10.71	CHALIN	⊖								
	76.07	76.91		37.27	26.56	KIN-SZE-NIAN-CHIAO	⊖							
	97.17	68.04		50.10	47.69	21.13	CHAPU	⊖						
	114.33	85.20		75.56	69.05	30.29	17.16	HAIYEN	⊖					
	144.77	115.64		106.00	95.29	60.73	47.60	30.44	ZAKOW	⊖				
	167.00	130.75		129.11	110.10	91.04	70.71	53.55	23.11	MAINING	⊖			
	175.70	146.57		136.93	126.22	99.66	70.53	61.57	30.93	7.82	HUKATOU	⊖		
CHEKIANG	193.91	169.70		155.14	142.43	117.07	96.74	79.50	49.14	26.03	10.21	CHIADZEE	⊖	
	213.00	183.87		174.23	163.52	136.96	115.03	98.67	60.23	45.12	37.30	19.09	HANGCHOW	⊖
	215.60	186.97		176.03	166.12	139.56	110.93	101.27	70.03	47.72	39.90	21.63	WULINHUA	⊖
											2.60		WULINHUA	⊖

boat with four propellers, will be constructed, with accommodation for 150 passengers and 10 motor-cars.

(3). MINGHONG-NANCHIAO SECTION.—Length 10 kilometers. Built of broken stone with a cinder road surface by the Fengshien and Nanhwei district of Kiangsu Province. The improvements of this section of the road were undertaken by the Fengshien Reconstruction Bureau, with the financial support of the Department of Reconstruction of Kiangsu Province.

(4). NANCHIAO-CHALIN SECTION.—Length 11 kilometers. Running on top of a new embankment through low and flat country. Broken bricks were used for the foundation of the roadbed, upon which cinders and crushed shells are alternatively used as paving materials. In this section, especially, there are many new bridges.

(5). CHALIN-KINGSZENIANCHIAO SECTION.—Length 26 kilometers. Mostly on top of the sea dyke. The solid roadbed of the dyke justified the use of shells as a temporary surfacing material. Later, when traffic increases, a more permanent pavement may be substituted.

Sections 4 and 5, having a total length of 37 kilometers, were completed by the Kiangsu Reconstruction Department on September 25, 1932, at a cost of about \$213,000, including a grant from the Central Road Fund of the National Economic Council of \$46,900.

(6). KINGSZENIAN-CHIAO-CHAPU SECTION.—Length 21 kilometers, of which 12 kilometers of earth-work was done some time ago. For the time being the road surface consists of cinder and sand on broken stones, which materials are obtained locally. Dependent on subsequent experience and an increased traffic the road surface may later be improved. This section was completed at the end of September, 1932, at a cost of about \$90,000 borne by the Chekiang Reconstruction De-

partment, included in which sum is a loan from the Central Road Fund of the National Economic Council of \$26,600.

(7). CHAPU-HANGCHOW SECTION.—Length 118 kilometers. The part Hangchow-Haining was built first as a commercial enterprise some time ago ; later it was taken over by the Chekiang Highway Administration. There are several sharp curves, and workmen are now engaged in removing these. The greater part of the cost will be paid by the National Economic Council's Central Road Fund. An omnibus line is now running between Hangchow and Chapu, with 3-5 daily round trips.

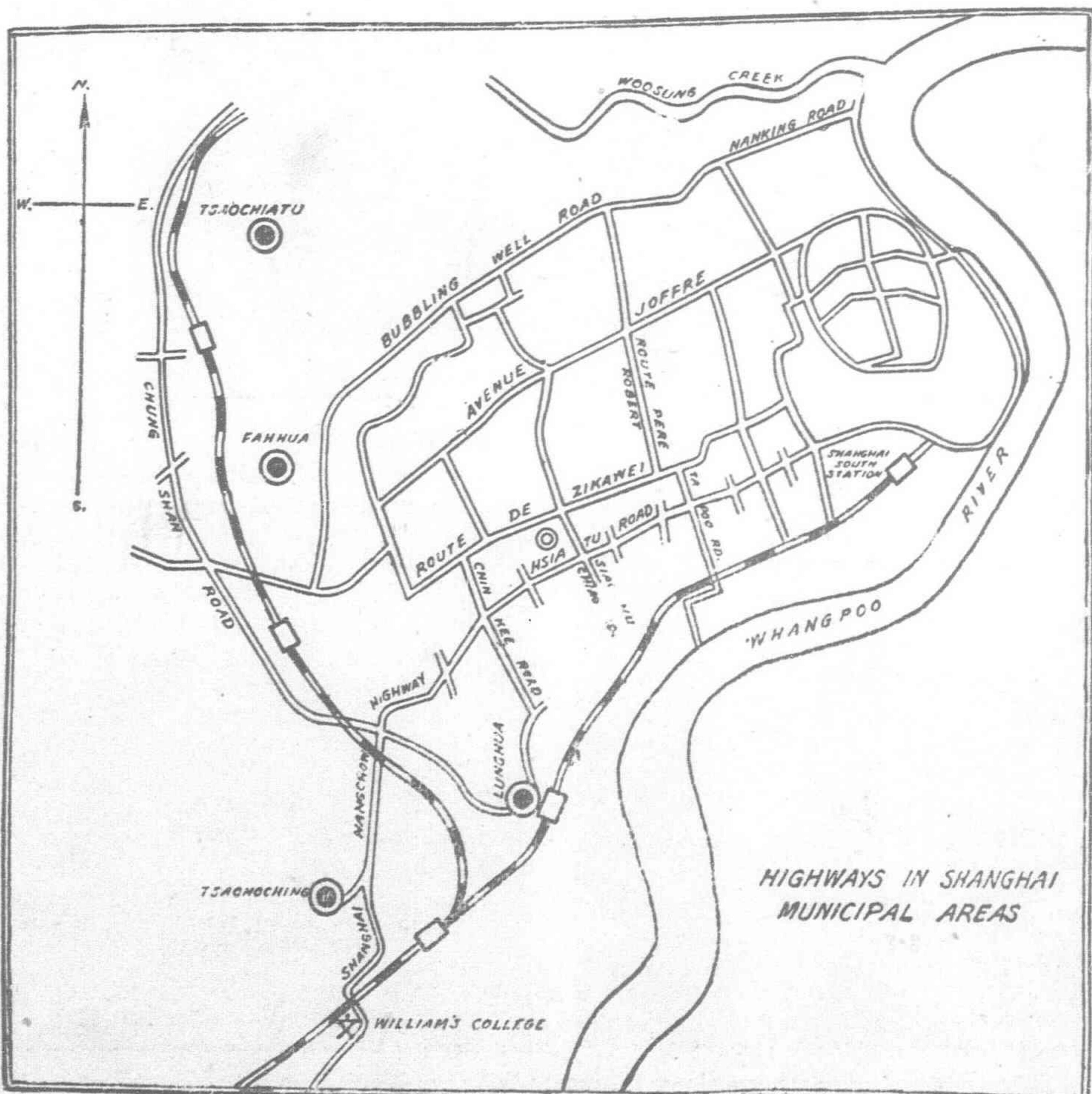
The new road has a width of  $7\frac{1}{2}$  meters of proper roadbed and three meters of paving. The section Shanghai-Minghong has a roadbed-width of nine meters, and a paved width of six meters.

The main part of the road is built according to type "A" of the Road Standards of the National Economic Council. Future widening to  $5\frac{1}{2}$  meters pavement width, according to type "B," will be undertaken when traffic increases, which, it is to be hoped,

## Highway Equipment

(1). ROAD SIGNALS.—All along the road signals have been placed, of two general categories : (a) Signals of warning of approaching curves, crossings, bridges and other dangers ; (b) Indications of names of towns, mileage and other general information.

Types, colors, etc., of these road signals are in accordance with the International Regulations and Agreements concerning Road Signals of Geneva. They were adopted at a meeting of the representatives of Chekiang, Kiangsu, and Anhwei Provinces and of the Nanking and Greater Shanghai Municipal Governments, held under the auspices of the National Economic Council.



(2). OMNIBUS STATIONS.—For the motor bus lines which are now in operation there are eight stations between Shanghai and Minghong, six between Minghong and Kingszenianchiao, two between Kingszenianchiao and Chapu, and twenty between Chapu and Hangchow, totalling thirty-six stations. More stations will be added between Minghong and Kingszenianchiao.

In future, between Shanghai and Minghong the original omnibus company will run its buses as usual; from Minghong to Hangchow another omnibus line will commence operations under the control of the Chekiang Highway Administration. The National Economic Council has entrusted the service of the Minghong Ferry to the Department of Reconstruction of Kiangsu Province.

(3). FILLING STATIONS.—Filling stations are set up at all important points on the road. In addition, a service by means of tank cars will be available.

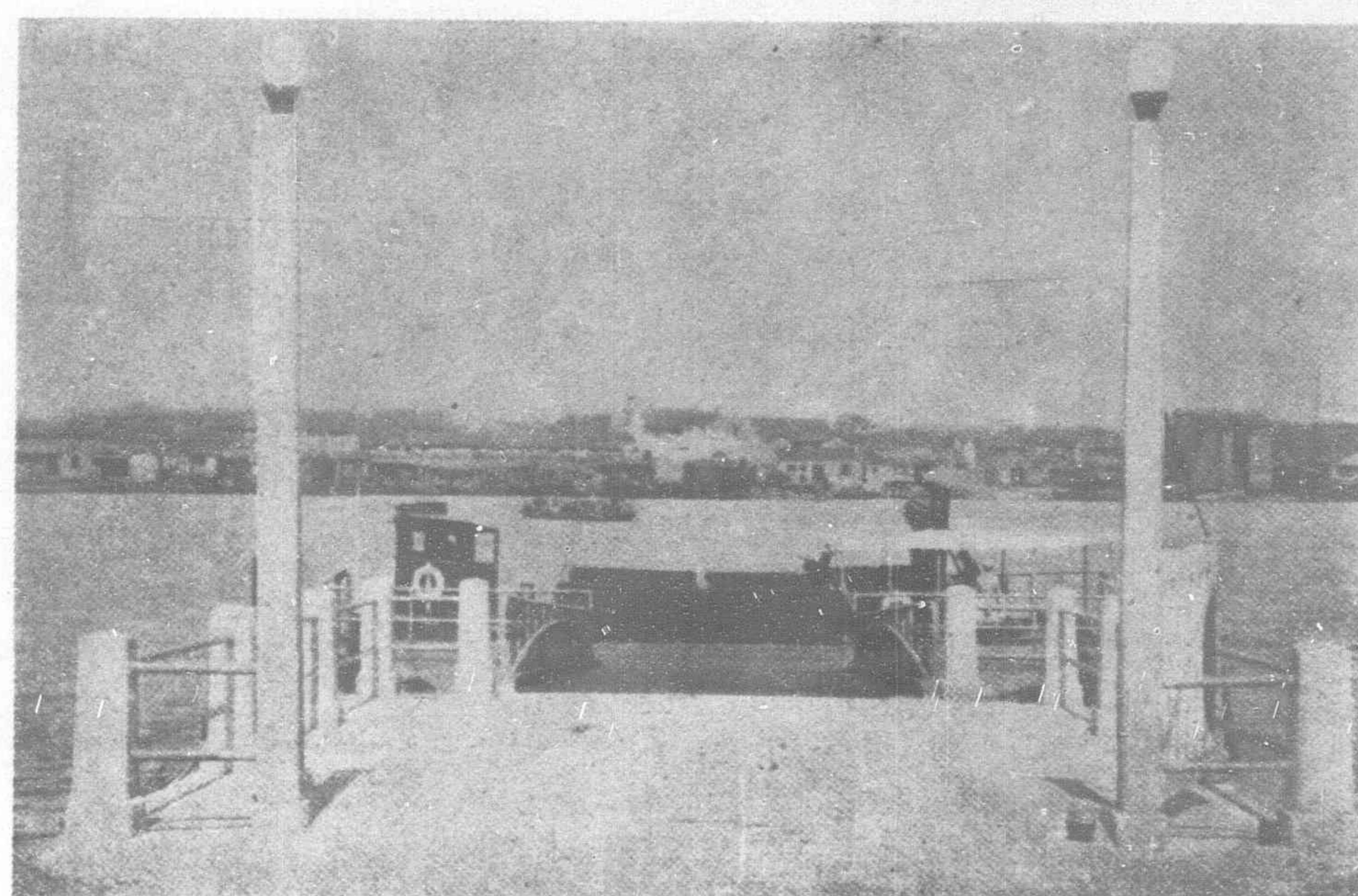
(4). POLICE PATROL AND LONG-DISTANCE TELEPHONE.—For the safety of motorists, special police patrols will shortly be organized in addition to the local police forces. A long-distance telephone line will be installed along the road, to serve the public and the police.

(5). MILESTONES.—Milestones have at present been erected in the sections of the road within the Chekiang Province. A uniform system of indicating mileage is under consideration.

### Commercial Survey

Reference to a map will show that the Shanghai-Hangchow road traverses a country with very divergent local conditions. Fishery products vie in importance with the products of agriculture, such as rice, wheat, silk and cotton, while the manufacture of salt is one of the main occupations. Beans, tea, hemp, timber, fruit, etc. constitute a minor commercial activity. Chapu is the center for the timber market for both Chekiang and Fukien Provinces. It is also well known for its salt manufacture. Haining has an agricultural output better than anywhere else in Chekiang Province. Its melon and fruit market sends its products all over the country.

The large number of industrial plants in Shanghai and in different other places are within the reach of this road. In Shanghai there are textile mills, leather, tobacco and other factories. In Sunkiang there are the well-known potteries. Breweries, tanneries, and factories for matches, paper, and candy, etc., have now developed quite extensively. Hangchow is particularly well known for its silk, and tea.



The Ferry at Minghong

Special kinds of fish and vegetables, not found anywhere else in the world, are also obtained within the territory tapped by this highway. Fans, mats, and various kinds of ornaments made in this part of China are famous all over the world.

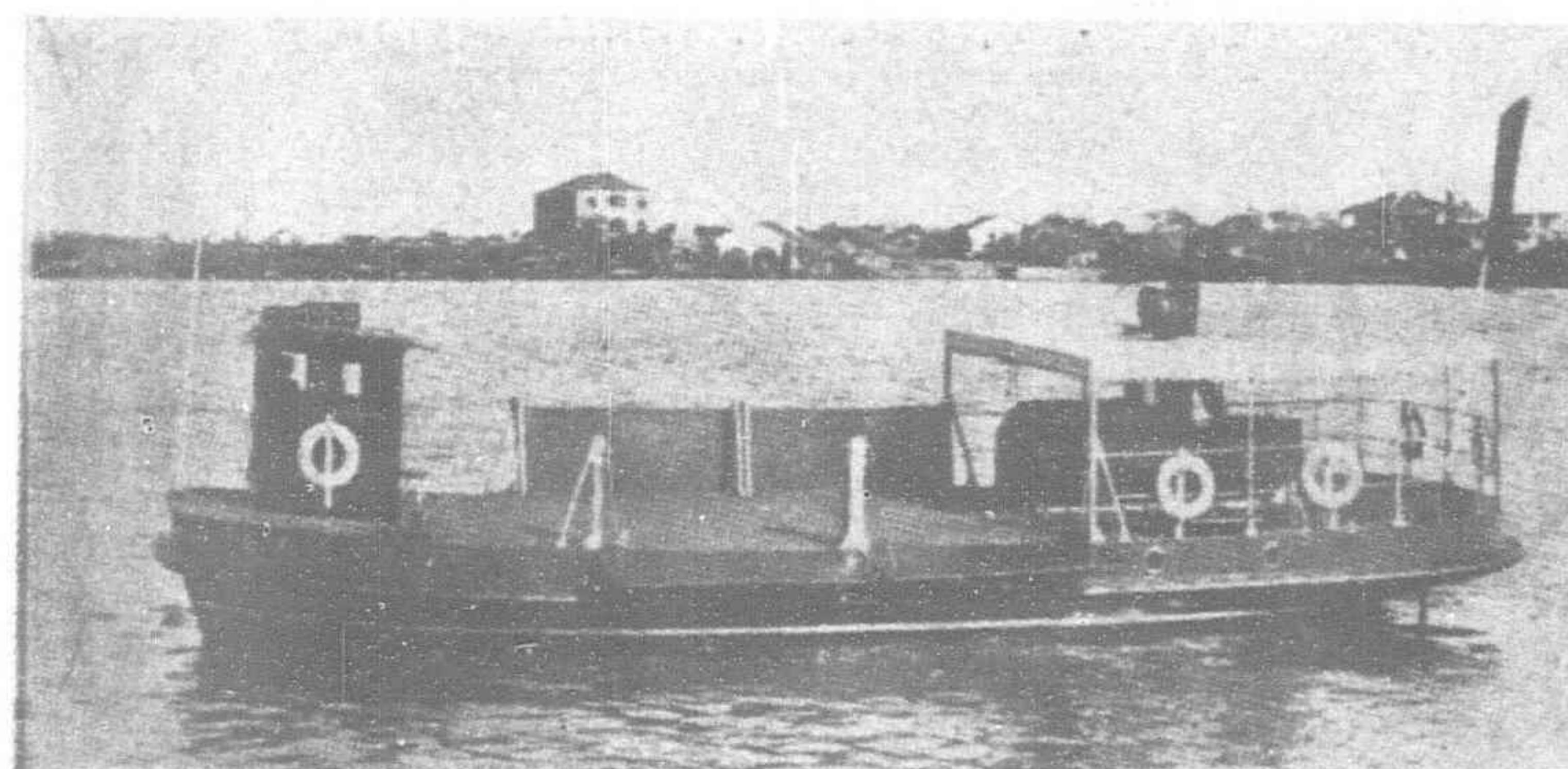
### Information to Tourists

(1). MILEAGES.—The Shanghai-Hangchow road has a total length of 216 kilometers, of which the Shanghai-Kingszenianchiao section, 76 kilometers long, is in Kiangsu Province, and the Kingszenianchiao-Hangchow section, 140 kilometers long, is within Chekiang Province. A distance schedule elsewhere in this pamphlet gives detailed mileages.

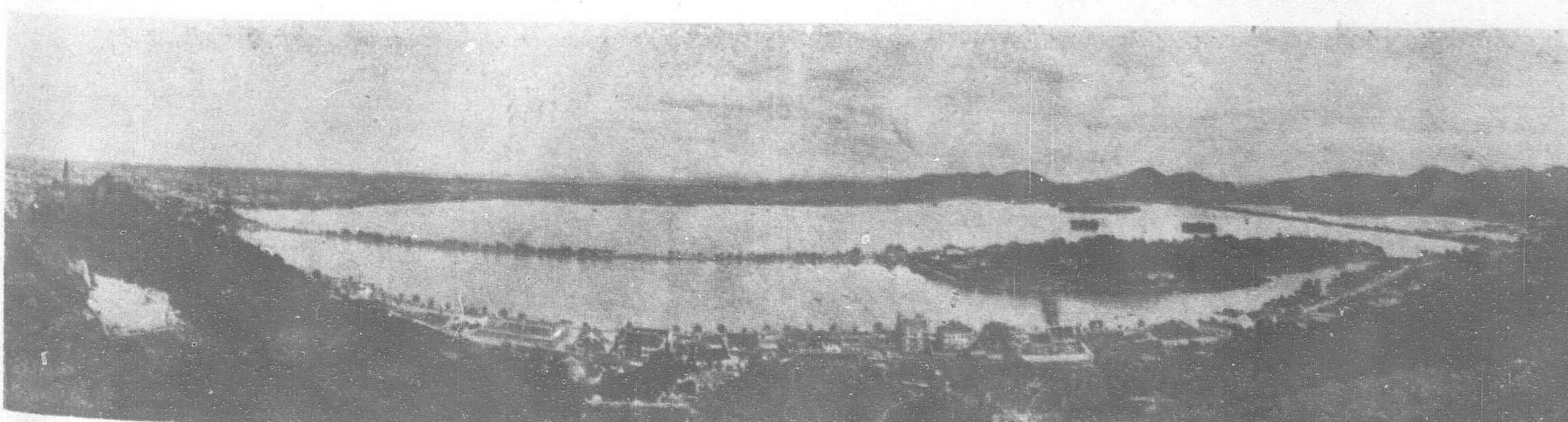
This new road connects with the Nanking-Hangchow and Hangchow-Hweichow Main Highway. From Shanghai there radiate several shorter roads: Shanghai-Woosung-Paoshan, Shanghai-Lunghwa, Shanghai-Chipao, Shanghai-Liuho-Paoshan Roads. The Shanghai-Hangchow Road has the following

branch roads: Chapu-Pingwu, Zakow-Yuenhwa, Hukatow-Changan. From Hangchow there goes the Hangchow-Fuyang Road. A branch of the Hangchow-Nanking road leads to Mokanshan, a summer resort famous for its beautiful scenery. A branch road from the Hangchow-Hweichow highway will lead to the Tien

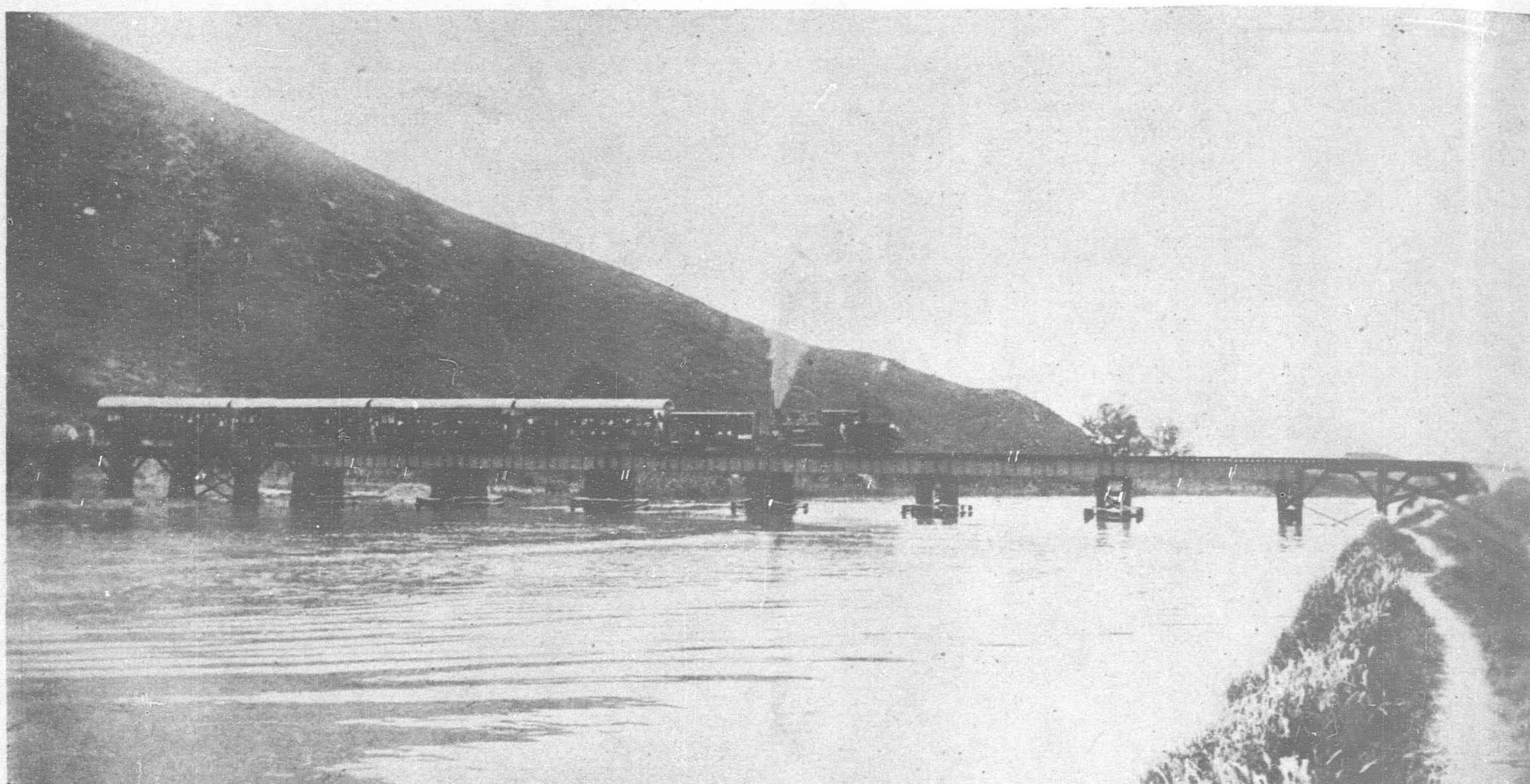
(Continued on page 485)



Steel Ferry Boat at Minghong



West Lake—Hangchow



The crossing of the Pu Yang River at Chien Shan—This is the longest bridge on the railway. Steel plate girders on cluster pile piers

## The Hangchow-Kiangshan Railway\*

By ARTHUR M. SHAW, Consulting Engineer

**O**N the sixth of March, of the present year, commercial service was extended to cover the entire length of the first division of the Hangchow-Kiangshan railway, the first regular train entering Lanchi on that date. Service over a portion of the line had been started on the first of June of the previous year, and this was gradually extended, following closely behind track laying.

As this is a pioneer enterprise, vitally affecting the social and economic life of one of the richest, and most populous sections of the country, there has been a widespread interest in its success. Several brief articles have been published, describing certain features, but as an answer to the many inquiries which still are being made, the following more or less detailed description of the physical characteristics of the line has been prepared, together with a brief discussion of future plans, mention of the resources of the areas traversed and other salient features.

Starting at Kiang Pien, which is on the south bank of the Chien Tang Kiang, opposite Hangchow, the railway runs in a generally south-westerly direction through the following towns and cities :

### STATION LIST AND KILOMETRAGE

Kilom from Kiang Pien	Name of Station
0 .. ..	Kiang Pien
8 .. ..	Siao Shan
17 .. ..	Pai Lu Tang
23 .. ..	Lin Pu
31 .. ..	Chien Shan
40 .. ..	Mei Chih
50 .. ..	Chih Pu
57 .. ..	Pai Men
65 .. ..	Chuki
83 .. ..	Pai Tou
90 .. ..	An Hwa
98 .. ..	Cheng Chia Wu
110 .. ..	Suchi
122 .. ..	I Wu

Kilom from Kiang Pien	Name of Station
137 .. ..	I Ting
151 .. ..	Hsiao Shun
163 .. ..	Tang Ya
178 .. ..	Kin Hwa
187 .. ..	Chu Ma Kwan
200 .. ..	Lan Chi

The operations to date are proving to be most satisfactory and one feature has been especially gratifying to those interested in the success of the enterprise. This is the rapid development of the freight business. From past history of the new railway project in China, it was expected that passenger revenues would increase rapidly, but it was thought that it would require several years to develop a satisfactory freight business. This undoubtedly will be the case but the increase in freight offered has been much greater than was anticipated. In fact, the demand has reached such a point that an additional order already has been placed for goods cars and it is expected that these will be in service late in the present season. Until these are available it will be impossible to handle all of the business of this class now being offered.

The volume and character of traffic does not demand full, standard ballasting but a moderate force continuously is engaged in supplying ballast during operation and the roadbed has now reached a condition which permits higher speeds. It is anticipated that a new schedule will go into effect shortly reducing considerably the running time of the more important trains. The total cost of the completed line with equipment is slightly in excess of seven million dollars.

### Type of Construction

In the matter of gradients and curves (items which most vitally affect the cost of operating trains), the line has been built in conformity with the standards of the Ministry of Railways for the construction of Chinese Government Railways and the track and all equipment are of standard gauge (4-ft. 8½-in.). A

substantial reduction was made, however, in weight of rail, width of roadbed and other features, the standards for these being dictated by the existing stringent financial limitations. While it was necessary to practice the strictest economy, the location of the line and design of all details were carried through with the idea that a later revision to heavier standards would be necessary. So far as practicable, provision for this heavier service was made in the original construction of permanent works.

In the alluvial areas, which extend for about 70 kilometers from the Chien Tang Kiang, wooden trestles were quite generally employed for the major stream crossings, with stone culverts for the smaller streams. Each opening was made a matter of separate study and if found that it could be built as a permanent structure, at a cost not greatly exceeding that of a timber bridge, the permanent type was adopted. As relative cost was governed, to a considerable extent, by location (and cost of transportation of materials) this policy resulted in a most varied assortment of water-way structures, ranging from purely wooden trestles, through small stone culverts, large-diameter concrete pipes (often a series of as many as four), concrete arches up to 16-ft. span, stone abutments with steel girders, and in several instances, masonry piers and

abutments, designed for steel girders but crossed temporarily by the use of wooden stringers.

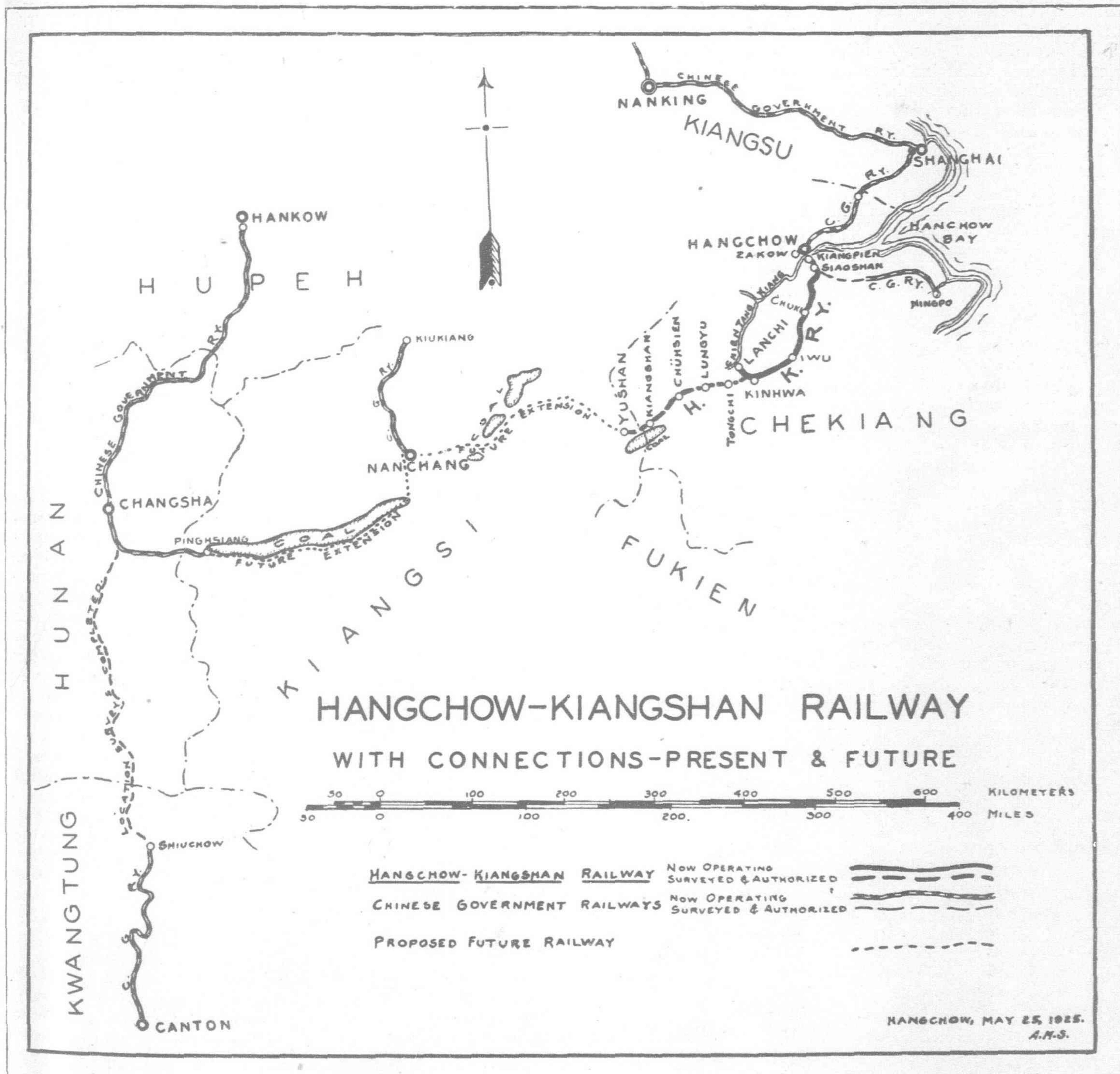
Bridge piers, culverts and similar permanent structures are of a design which renders them suitable for later use under much heavier loading.

## Rolling Stock

The locomotives and cars secured for initial operation were selected to suit the estimated requirements of the first few years of operation. While these all are necessarily of limited weight and capacity, as dictated by the light track standards, the details of all units conform to the best modern practice. Air brakes and automatic couplers are used throughout, passenger trains are lighted by electricity, and various devices have been installed which the better railways have found to contribute to efficient service, the comfort of passengers and the safety of employees.

## LIST OF ROLLING STOCK

6 Locomotives, semi-express type, 2-6-0 wheels, 54 tons each.  
3 Locomotives, semi-express type, 2-6-0 wheels, 32 tons each.



- 30 Passenger cars, capacity 50 passengers each.
- 20 Open cars, without sides, mainly for construction, 15 tons capacity.
- 16 Open cars, with sides, 15 tons capacity.
- 4 Closed goods cars, 15 tons capacity.

Trains equivalent to three round trips over the full length of the division are operated daily. Owing to the heavy demand for passenger service, as compared with the moderate freight traffic, all trains are operated as passenger trains, though facilities are provided for handling such freight as is offered. It is probable that as soon as grain movement starts, following the first harvest of the season, it will be necessary to add an exclusively freight train.

### Financing and Cost

While formally approved by the National Government, this railway is purely a Provincial project, having been financed entirely by funds provided by Chekiang Province. It was instituted by the former Provincial Chairman, Mr. Chang Chin-kiang, and has been continued by his successors. The project has been under the direct charge of Mr. Tu Chen-yuen as Director and Engineer-in-Chief. General administration is through the Construction Department of the Province which is headed by Commissioner Tsing Yung-fu.

The bulk of the construction funds have been supplied directly from provincial treasury or in the form of proceeds from the sale of provincial bonds, though a comparatively small sum for the final completion, was secured as a loan from a group of Hangchow banks. The total cost to date, including construction and equipment, has been approximately \$7,200,000 or \$36,000 per kilometer (\$58,000 per mile).

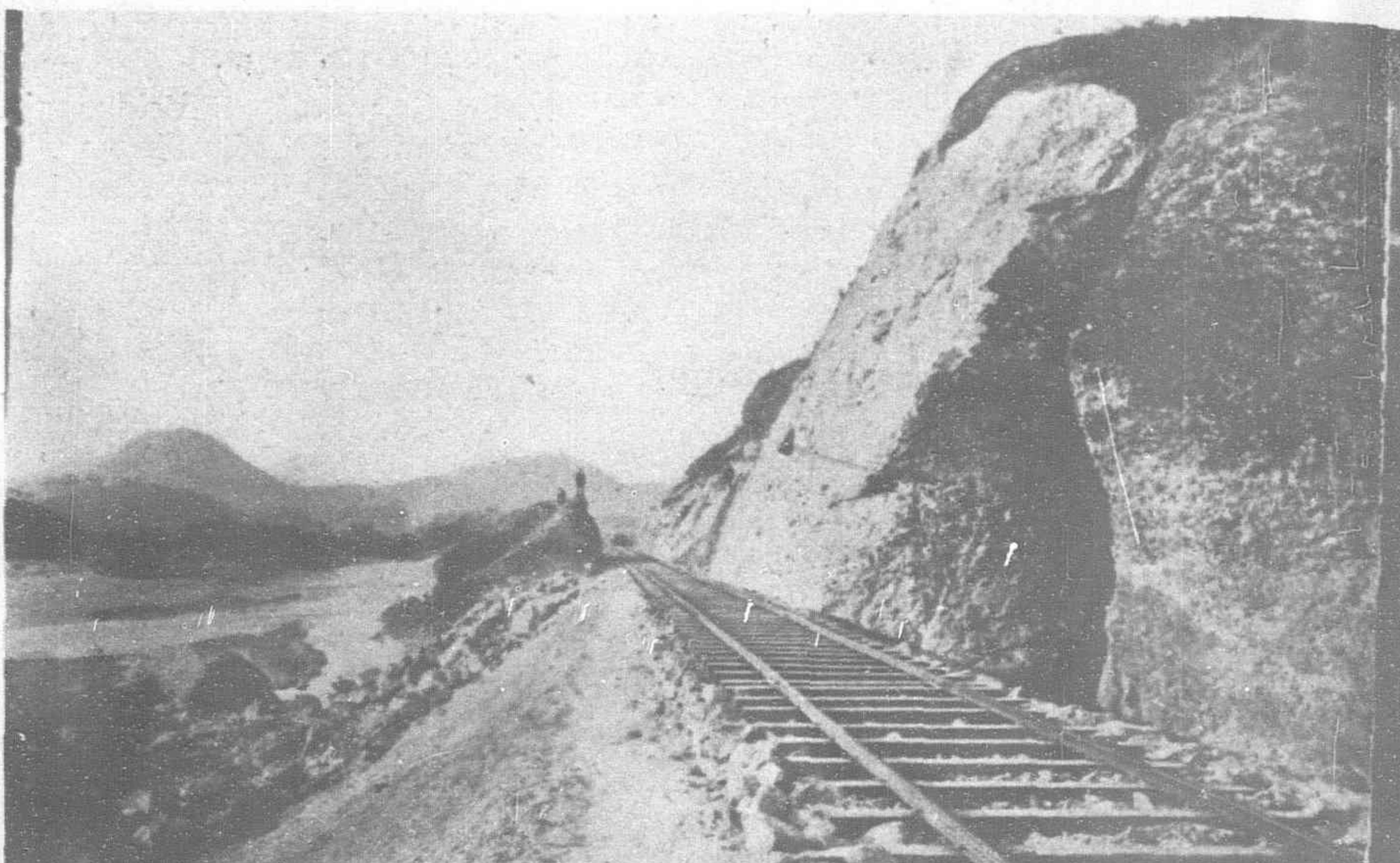
This is considerably less than one half the cost of a railway of the same length but built and equipped to full heavy-duty standards.

Assuming that the light construction adopted will be found suitable for the business secured, for a period of ten years, and that traffic demands then will call for heavier construction, it is apparent that the interest on investment, which will be saved by this initial light construction will much more than offset any losses which it might cause. These losses (which are more apparent than real) will consist of:—

Replacement of light rails by heavy rails (using the relieved material on sidings or branches and extensions).

Reconstruction of temporary wooden bridges (the most of which, on account of decay, would require renewal in any event).

Purchase of heavier engines and cars (still using the original equipment on local trains and on branch lines).



Hangchow-Kiangshan Railway.—Skirting close to the Pu Yang River, near Chu Ki.

As all track and equipment are of standard gauge, such changes can be made gradually, economically, and with no interruption of service.

### Territory Traversed

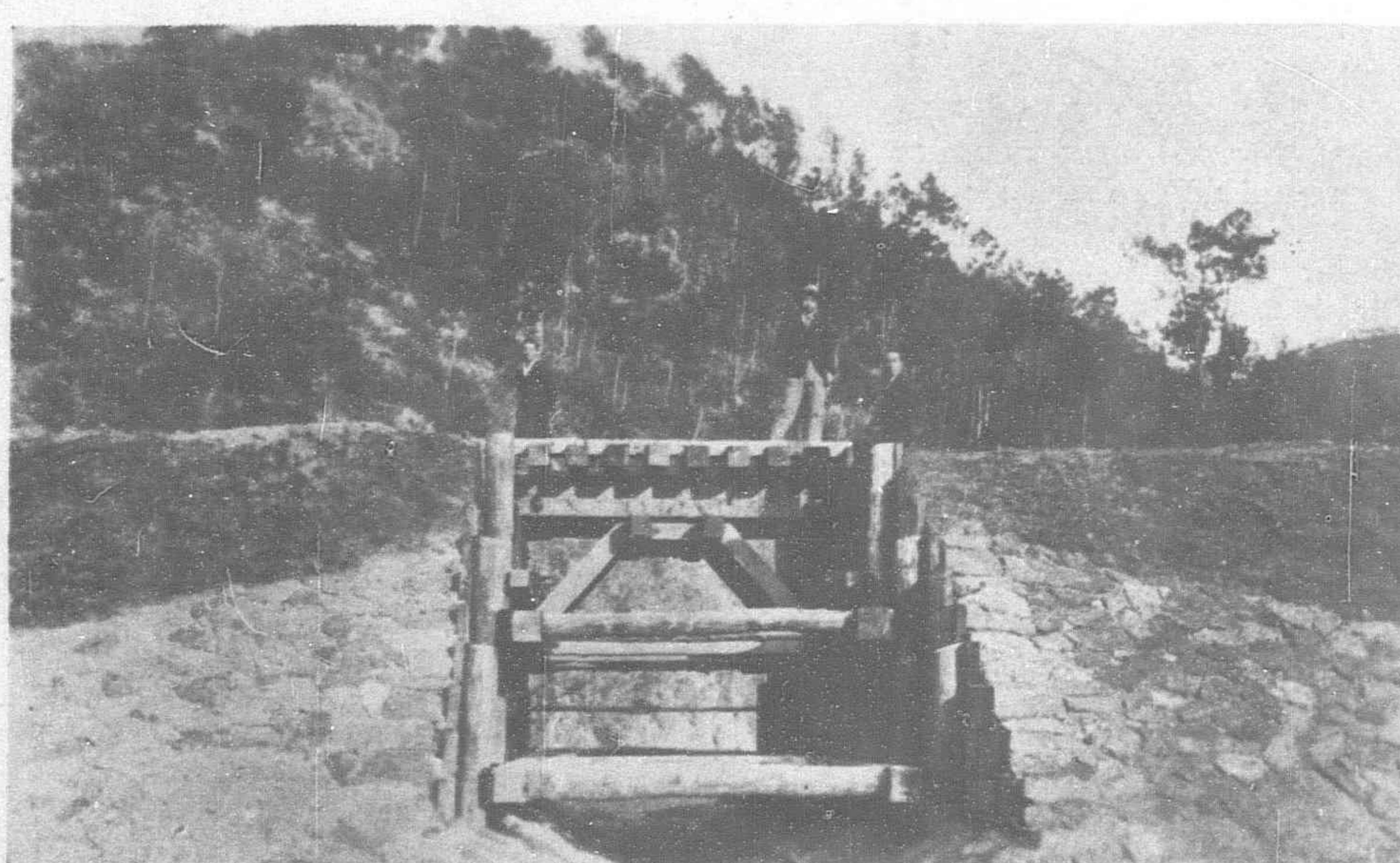
Soon after leaving the bank of the Chien Tang Kiang, the line follows up the valley of the Pu Yang Kiang for a distance of about 100 kilometers, and then crosses a low divide into the valley of the Kinhwa Kiang, which it follows to the present terminus at Lanchi. The scenery, during the earlier part of the journey to Lanchi, is somewhat monotonous as it is through the level, alluvial plains, but beyond the first crossing of the Pu Yang Kiang at Chien Shan the line alternates between the foot-hills and the river and presents a variety of attractive scenery. At a few points, the mountains extend directly to the river bank, necessitating an occasional heavy side-hill cutting but affording a most attractive view of river and rugged mountain side, a combination that is always pleasing. At a point a few miles beyond Anhwa, there is a section which never fails to arouse admiration, with its sheer rock cliffs on one side of the railway and, almost underneath, there is a swift mountain stream which appears to be trying to tear away the solid rock embankment of the railway.

After entering the valley of the Kinhwa Kiang, the line bears away from the river, traversing a stretch of rolling country, always in sight of the mountains but never reaching them. At Lanchi, however, it was necessary to pass in through some quite rugged hill country as the city had been built up solid to the bank of each

of the rivers. This required some heavy work but resulted in an interesting and picturesque line. By this entrance, it was possible to locate the station convenient to the business center of the city and also, to extend the line down to the river bank, affording excellent facilities for river-boat and rail transfer.

Most of the station structures are of a more or less temporary nature but the station platform at Lanchi is quite unique, in that it is of solid rock, "in situ." A shallow rock cut was to be taken out at the point selected for the station and, in making this excavation, care was exercised to leave the native rock in place to form the platform. It is earnestly hoped, by those in charge, that this one facility may not require removal!

The selection of the route of the railway was governed entirely by economic factors, all avoidable costs being eliminated unless they would clearly contribute toward efficiency of operation or better service. In spite of this necessity of placing utility before the aesthetic, there is much of interest and beauty to be seen along the line, with its river and mountain



Hangchow-Kiangshan Railway.—A temporary structure which will be re-placed by a concrete culvert

scenery, the fertile fields and frequent villages through which the train passes, while the peak of the famous Pei Pan Shan may be seen during several hours of the train ride to Lanchi. Rising three thousand feet above sea-level, this mountain is especially impressive as it rises quite abruptly from the valley floor. On the side of the mountain, at an elevation of 2,500 feet, there are the most ideal spots for summer resorts, with all the natural advantages required for a delightful summer vacation; pure spring water in abundance, varying mountain and valley scenery, paths through the deep woods, quaint villages and an equably cool climate.

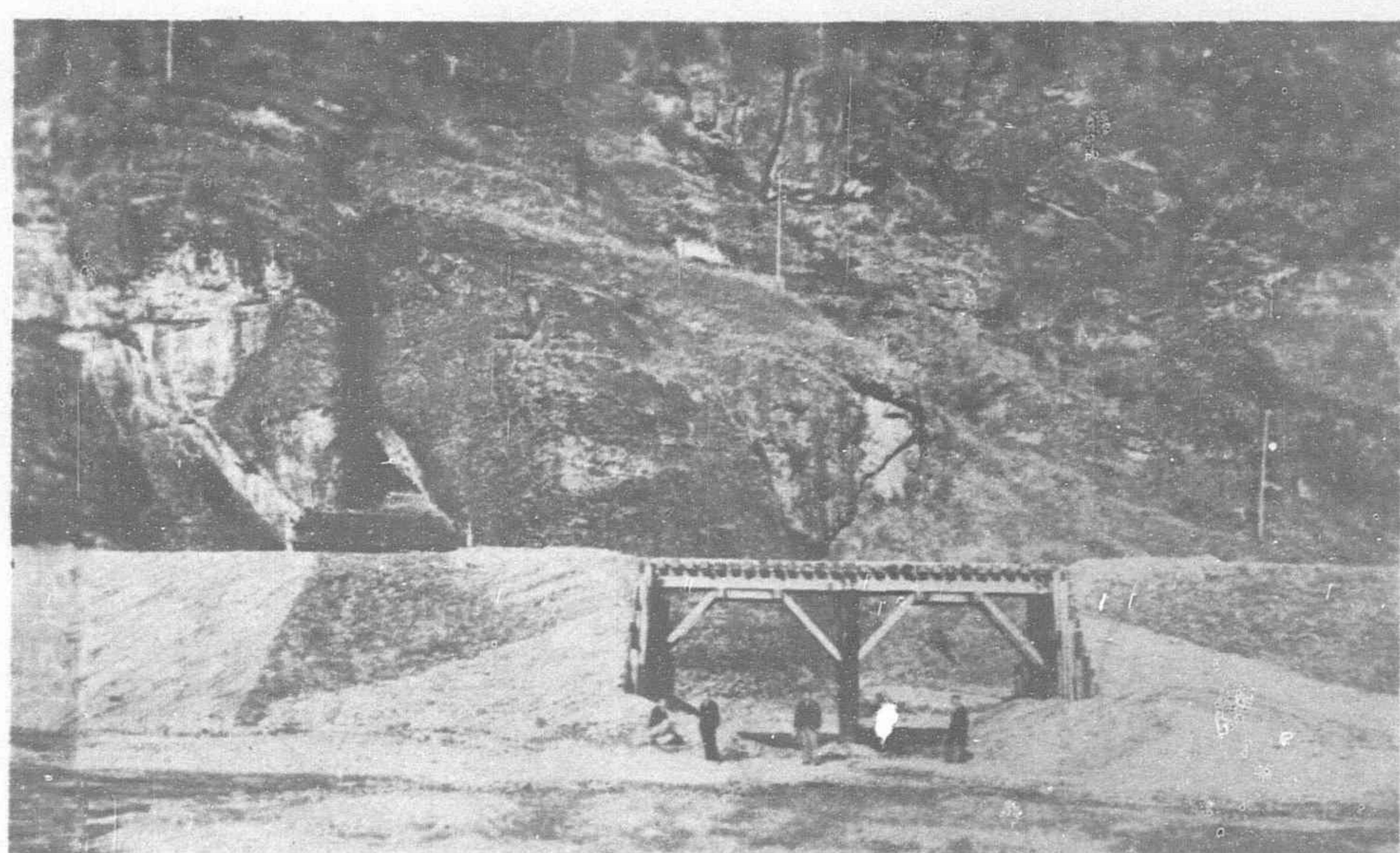
This section has been patronized as a summer resort by residents of Kinhwa and Lanchi (from either of which it can be reached by a few hours travel by chair). Those who have spent several summers on the mountain say that they never have seen the thermometer go above 87 degrees (F.) and that it seldom reaches this maximum. The railway officials consider this potential summer resorts one of their valuable assets. It is expected that a motor road will be constructed to the base of the mountain, thus reducing the time required for reaching a suitable resort site to about two hours.

### Area and Population Served

With the exception of Kiangsu Province, Chekiang is the most densely populated province in the country, while the areas traversed by this line are among the richest and most populous of this province. The *hsiens* which are directly tapped by this line, together with their population, are given as follows:

<i>Hsien</i>	<i>Population</i>
Hangchow . . . . .	820,000
Hsiaoshan . . . . .	523,200
Chuki . . . . .	529,300
Iwu . . . . .	294,100
Kinhwa . . . . .	235,000
Lanchi . . . . .	267,600
<b>Total: . . . . .</b>	<b>2,669,200</b>

*Hsiens* adjoining these which are traversed by the railway, and which have no other adequate means of transportation, will also become tributary to the line. These have a total population of only slightly less than those shown in the foregoing list. Estimating that one half the area and population of these bordering *hsiens* will be tributary, this railway will serve as the main artery of



Hangchow-Kiangshan Railway.—A standard type of wooden pile trestle.

transportation, nearly four million people, not taking into account the service which will be given to people residing beyond the terminus.

### Resources of the Territory

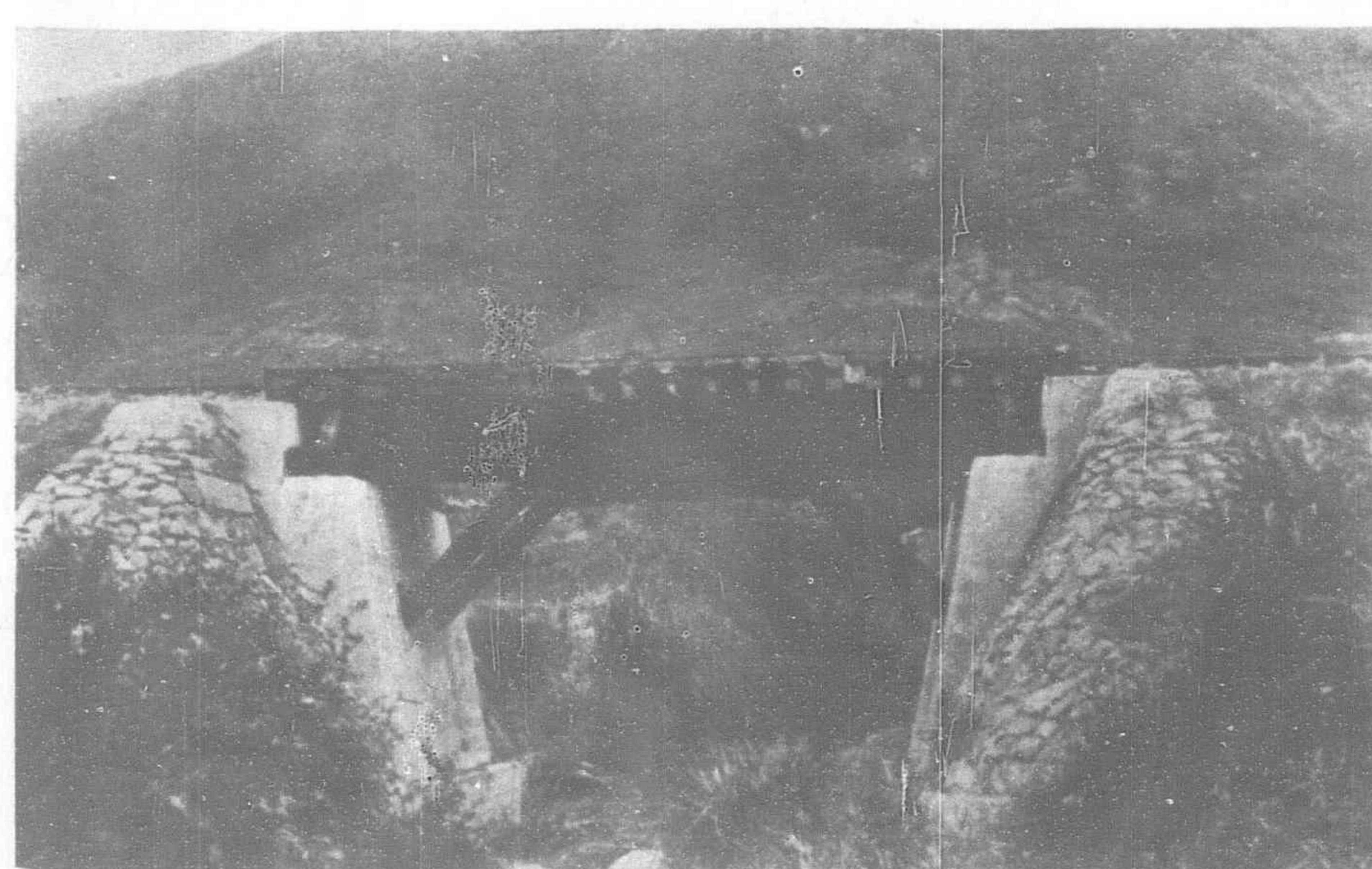
The most important single commodity which is produced in the area served is rice, much of which is shipped to the Shanghai and other markets. Miscellaneous farm crops and other cereals are also produced, such as wheat, maize, rape, beans and an infinite variety of vegetables. For several miles up the valley from Lanchi, some of the finest varieties of fruit are grown, the peaches and plums surpassing anything which can now be secured on the Shanghai market. In the past, these have been grown only for local consumption, the surplus being a complete waste but, with quick transportation provided, and the Hangchow and Shanghai markets available, fruit growing should be highly profitable, especially if there can be combined with this, a canning and preserving industry to absorb the surplus and off-season production of both fruits and vegetables. The lower hill-sides, which are unsuited to general farming, are ideal for orchards. While the possibilities have not yet been fully investigated, it seems probable that various other tree fruits, nuts and other crops can also be produced to advantage.

In the vicinity of Iwu are immense deposits of fluorite and other minerals, the exportation of which has been carried on for years though the limited transportation facilities have made it impossible to develop this business on a large scale.

The greatest single economic advantage which will follow the advent of a cheap and rapid method of transportation in the area served by the railway will be in the direct and indirect benefits to agriculture. Rail transportation will make possible a more widespread use of commercial fertilizer; it will make possible the marketing of the surplus of production and the importation of commodities which can be produced more economically in other sections; it will reduce the cost of materials now imported; and it will improve social conditions by encouraging outside contacts and by improving mail service.

### Completion of the Railway

In the foregoing, reference is made only to that portion of the line which is now in operation, from Hangchow to Lanchi. As soon as the completion of this portion of the line was assured, Director Tu began investigating the possibilities of financing the next section, from Lanchi to Yushan. Some encouragement was received but it was not until the active interest and support of the newly-arrived Commissioner of Construction,



Hangchow-Kiangshan Railway.—A temporary wooden span, resting on concrete abutments which are constructed for a permanent steel girder

Mr. Tseng Yung-fu, were secured that the finances were placed on a sound basis which would insure the completion of the entire project. As soon as the Commissioner realized the important advantages which would result from the construction of a railway entirely across the Province, he entered into negotiations with his associates in the Provincial Government, with the National Government and with private interests and was able to secure the active support of all.

By the authority of the Provincial Government, over \$1,000,000 was made available for railway construction by the sale of the Hangchow electric light plant to private interests.

On the strength of the excellent security which such a property offers, Chinese banks have agreed to loan another \$2,500,000, the faith of the bankers, both in the project and in those who direct it, being evidenced by the fact that this new loan is made at a much lower rate of interest than had previously been obtainable.

An additional loan of £200,000 (about \$3,600,000) has been secured from the British Boxer Indemnity Fund, through the co-operation of the Ministry of Railways. This sum will be used in the purchase of materials of construction and railway equipment.

With these sums available, it was possible to start construction on the second section early in July. It is estimated that it will require about twenty months for the completion of construction and the start of through train service to Yushan.

The character of the country traversed will be similar to that of the first section, excepting that there will be three rather important stream crossings; and, between Kiangshan and Yushan, it will be necessary to cross the range of mountains which forms the boundary between the two provinces. An exceptionally favorable location for this crossing has been found, however, the final location survey showing a maximum cutting at the summit of less than fifteen meters, with no tunnels or exceptionally heavy work. The cost per kilometer will be slightly greater than that of the first section, due to some increase in the amount of rock cutting, the three bridges mentioned will be required and, especially, all waterways, from the smallest culverts to the largest bridges will be of permanent construction. Including the additional equipment which will be required, the cost of the second division may amount to as much as \$40,000 per kilometer.

The character of crops grown in the second section is similar to that of the first, though the proportion of rice becomes less and of other cereals greater.

Between Kiangshan and Yushan, there are considerable areas of somewhat lighter soils, which should be suitable for cotton growing, though so far as is known, cotton culture in this Province has been confined to the coastal regions.

At Yushan, contact is made with the system of navigable rivers of Kiangsi Province, goods from the interior being brought to Yushan by boat, for shipment to eastern markets. Transfer overland to Kiangshan is made by wheelbarrows or to Changshan by wagons and motor trucks. From either of the latter points, freight is sent down the river, on its way to Hangchow, either by bamboo rafts or by small junks (depending on the water stage). At Lanchi, transfer usually is made to larger junks.

With direct rail shipment available from Yushan, the cost of transportation will be greatly reduced while, with proper management, losses by breakage, exposure to the weather and pilfering should become negligible.

In observing the transfer of Kiangsi fine pottery, over the mountain, from Yushan to Changshan, it was noted that the packing was of an especially extensive and expensive nature, apparently exceeding in weight, and certainly exceeding in bulk, the material which it was designed to protect. A method of transportation which would provide direct transfer from boats to cars at Yushan, and no further transfer until Hangchow is reached, would make it possible to save much of this cost of packing and of transportation charges on the packing material. This is just one of the many savings which can be effected by this new railway, if completed through to the head of navigation in Kiangsi Province.

In addition to the extension of the line to Yushan, the plans for completion include a crossing of the Chien Tang River to permit the operation of through trains, in connection with the Shanghai-Hangchow Line. This crossing will be made either by a train ferry, or a bridge, depending on the amount of business in sight and the funds available. There is a suitable location for either type of crossing at a point near the present terminus of the Shanghai

line, near Zakou. By providing such a crossing, goods and passengers may be transferred direct from one car to another, or it will be possible to operate through cars if conditions warrant.

It is reasonable to expect that, with such a crossing provided, the completion of the Ningpo line will be undertaken as one of the early projects of the National Government Railways, making some arrangement with the Hangchow-Kiangshan Railway for the joint use of the bridge or ferry.

### Purpose of the Railway

The project was conceived, and construction started, by the former Provincial Chairman, Mr. Chang Chin-kiang, mainly for the economic betterment of the Province and to improve the social conditions of the section served. It was also realized that the line would have an important political aspect, affording a ready means for the transportation of troops and supplies and otherwise contributing in national defense measures.

While it is obvious (and even before completion to Lanchi, it was demonstrated) that the railway will serve all these purposes, it is just as obvious that, with the completion to Yushan, the line may become an important source of revenue, and this without imposing a tariff rate at all out of proportion with the service rendered. If the operation of the railway is conducted with the same careful regard for efficiency and economy as were exercised in its construction, it should begin to yield a net profit, over and above operating expenses, almost from the first. The main factors which will contribute toward this will be:—

1. A dense population along the entire route, constituting a business already developed and waiting for the service.
2. An exceptionally rich agricultural section for at least 90% of the distance traversed, from which it will be possible to develop a profitable freight business (though this will come more slowly than the passenger business).
3. Practical freedom from effective competition.
4. Unusually low "fixed charges" in the form of interest on capital investment, due to the low initial cost.
5. Unexcelled opportunity for developing a profitable tourist and passenger business by operating in conjunction with the Chinese Government Railways.

### Future Extensions

Owing to their lower first cost and general suitability for short-haul traffic, it is probable that motor roads will be substituted for some of the shorter branch lines which have been suggested, at various times, to serve as feeder lines to the main line of the railway, though it is possible that one or more branch lines, of considerable length and reaching well back into other sections of the Province, will be undertaken later. It is not reasonable to expect that it will be possible to build another line within the Province, which will be so favorably situated as regards economical construction, rapid development of business and other attractive features as have been found for this railway but, with the main line constructed and its future assured, financing of promising branch lines should be made easy, even though the character of country traversed may be somewhat more difficult. An important factor in this further development will be the well-known fact that if other features are favorable, the net earnings of a railway increase at a much higher ratio than its increase in length. Each additional mile that is built not only becomes self-supporting, but it contributes to business of the rest of the system, especially in the "long-haul" business, which is the life blood of any railway. The step-by-step increment of that portion of line now in operation, as service gradually followed track laying, has served as an excellent demonstration of this truth, that revenues per kilometer increase rapidly with the increased length of line. At the same time, unavoidable costs of operation, per kilometer, decrease with the length of the line.

While it is probable that branch line construction, within the Province, will be undertaken by the Provincial Government, following methods which have proven to have been practical, there presumably would be difficulties in extending a provincially owned project through another province. As such an extension into and through Kiangsi Province, will be most desirable, from every point of view, some other method doubtless will be found for the construction of such an extension. Surveys have been made for only a short distance beyond the provincial border but an inspection

of available maps indicates that it will be thoroughly feasible to construct a line in the general location as indicated by the accompanying sketch map. This will run westerly to reach the coal fields in the eastern part of the province, thence south-westerly to the capital of the Province, Nanchang. From this city, the line would follow a south-westerly course, through the immense coal fields of western Kiangsi and connect with the present terminus of the Hankow line at Ping Hsiang. This will give connection with two lines of the Chinese Government Railways, one at Nanchang, with the line running to the Yangtze River at Kiukiang, and the other at Ping Hsiang. This latter point is only about 100 kilometers from Changsha, which is on the main survey line of the Chinese Government project, the Hankow-Canton line. It is generally conceded that the completion of the line to Canton will be one of the first of the important railway construction programs which will be undertaken by the National Government.

Whether such an extension through Kiangsi Province should be undertaken as a joint provincial venture, or as a separate action by each of the two Provinces, or partially by private capital, it should be operated (together with the present line) as a single unit, thus assuring the many advantages which can be secured only by such unit operation. If various agencies are interested in the construction of such a system, separate accounting will be required but this need not interfere with the efficient management and operation of the line as a single unit, with its natural termini at Changsha and Hangchow.

An inspection of the accompanying map will show the important place which such a railway will take in the future transportation system of the country. With its completion, and that of the Hankow-Canton line, an unbroken rail trip can be taken from Canton to Shanghai, or even to Harbin.

The following tabulation will give an approximate idea of the various distances involved, though it has been necessary to estimate

some of these distances from insufficient data and hence they may contain a few minor errors.

#### LENGTH OF EXISTING LINES AND PROPOSED FUTURE EXTENSIONS

From Shanghai to :	Distances in Kilometers	Last Named Section	Owner-ship	Kilom's in operation
Hangchow . . . . .	190	C.G.R.		190
Zakow . . . . .	195	"		5
Kiang Pien (opposite Hangchow) . . . . .	200	H.K.Ry.		—
Kinhwa . . . . .	378	"		178
Lanchi . . . . .	400	"		22
Yushan . . . . .	532	"		—
North-eastern Kiangsi Coal fields . . . . .	655	"		—
Nanchang . . . . .	830	"		—
Western Kiangsi Coal fields . . . . .	880	"		—
Ping Hsiang (present terminus) . . . . .	1,070	"		—
Chuchow (Jct. point to Canton) . . . . .	1,160	C.G.R.		90
Changsha . . . . .	1,176	"		16
Hankow (Wuchang) . . . . .	1,595	"		417
<i>Canton Line.</i>				
Chuchow (Junction point) . . . . .	1,160	C.G.R.		—
Shiuchow (present terminus from Canton) . . . . .	1,590	"		—
Canton . . . . .	1,810	"		220
	Kilometers	Percent		
Total of above lines in operation . . . . .	1,138	51.6		
Surveyed and construction authorized . . . . .	562	25.3		
Suggested—No adequate surveys . . . . .	511	23.1		
Total of railway to reach Hankow and Canton	2,211	100.0		

## HIGHWAY PROGRESS IN NETHERLAND EAST INDIES

By CARL H. BOEHRINGER, U.S. Assistant Trade Commissioner, Batavia

BUILDING and maintenance of roads in the vast area of Netherland East Indies are of utmost importance to its progress, because of its position as an exporter of agricultural and raw industrial products, principally rubber, sugar, rice, tea, coffee, kapoc, and tapioca, upon which depends its prosperity. The Netherland East Indies have an aggregate area of 735,714 square miles and a population estimated in 1930 at 61,000,000, distributed over a number of widely separated islands. With the exception of certain agricultural centers, the greater portion of this area is yet lacking in economic development, especially on the islands other than Java and Madura.

The Government has always fostered progressive improvement of roads. Even though a number of excellent roads on the various islands already have been built, often across mountainous country, funds and labor are constantly being expended on the steady extension of the highway system.

Governmental aid is considered more necessary now than ever before. As a result of the use of motor transport, both for passengers and for goods, traffic demands on roads in this colony have been gradually increasing.

In 1930 the Netherland East Indies had about 35,900 miles of highways, of which 24,850 were macadam (2,500 miles with bituminous surface), 50 concrete and brick, and 11,050 low-type, earth, sand-clay, or gravel, graded and drained. The road mileages of some of the larger islands are reported as follows: Java, 15,800; Sumatra, 11,400; Borneo, 1,400; Moluccas, Bali, Lombok, and Timor, 3,060.

There were 84,783 motor vehicles registered in Netherland East Indies at the end of 1930. Of these, 63,735 were passenger cars, 6,538 busses, and 14,510 trucks.

The Colonial Public Works Department has general control of road construction, improvements, and maintenance. Much of the work, however, is carried on by the Provinces themselves, which receive funds from the Colonial Government either by a fixed annual contribution or by incidental subsidies. Road expenditures during 1928 amounted to \$11,135,000, and during 1929 to \$11,548,800. Of these sums the Colonial Government spent

\$3,834,000 in 1928 and \$4,252,000 in 1929; the balance was derived from provincial funds.

Funds for road building and maintenance are drawn from the general revenues of the colony and the Provinces. Each of the islands has its own highway program, the main purpose of which is to connect existing roads and to open up remote regions. Programs for road construction and improvement in the four islands—Java, Sumatra, Borneo, and Celebes—total 85,600,000 florins, with 24,860,000 florins already expended, including colonial and provincial expenditures. Private interests will spend a large sum in addition. (The florin, the unit of currency in Netherland East Indies, equals \$0.402 United States currency).

Gravel, sand, and some asphalt suitable for road building are found locally; asphaltic materials and cement are imported, principally from the United States and Japan. During 1930 the imports of these two materials were as follows: Asphalt, 31,257 metric tons (18,257 from the United States); cement, 207,288 metric tons (170,520 from Japan).

As for road-building machinery, only tractors and road rollers are imported in appreciable numbers. In 1930 there were imported 131 units with a total value of about 937,000 florins, of which 112 units were from the United Kingdom. Bitumen boilers are made locally. Exports of road-building machinery from the United States in 1929 and 1930 amounted to \$13,093 and \$9,439, respectively. During these two years concrete mixers valued at \$18,229 were also exported from the United States to Netherland East Indies. Because of the importance and need of good roads, this should eventually be an attractive market for road-building machinery and tractors. With the cheapness of hand labor, however, greatly increased use of mechanical equipment is not to be expected in the near future.

There are about 4,532 miles of railways, of which approximately 70 per cent are in Java. The navigable streams and canals are of great importance as arteries of commerce. There are 11 ocean ports, of which Soerabaya, Tandjong, Priok and Semarang are the most important.

# Alternator Field-Breaking Devices

In order to limit or restrict the damage to an alternator on the occasion of a fault in the stator-windings, it is necessary to prevent sustained arcing, which would burn the laminations, and necessitate expensive repairs.

This may be effectively accomplished by instantaneously disconnecting the alternator from the bus-bars on the occurrence of a winding-fault, and then opening the field-circuit in order to reduce the stator voltage to zero, and prevent the maintenance of current in the stator-windings. The disconnection of the alternator from the bus-bars is effected by means of one of the well-known methods of protection, such as Merz-Price (see Pamphlets Nos. 52 and 226) or Self-Balance (see Pamphlet No. 330). The rotor flux must be reduced to zero in the shortest possible time after the alternator circuit-breaker has opened, and this may be done, for example, by opening the rotor field-circuit by means of an air-break circuit-breaker.

## Effects of Field-Breaking

The rotor-windings of an alternator are generally regarded as a highly inductive circuit; but in machines of modern design, which usually have solid forged-steel rotors, heavy damping is set up because of paths through the low-resistance steel of the core, which are mutually coupled with the rotor-winding by the main flux of the machine. By this means energy is dissipated in the form of eddy-currents, and the resultant voltage-rise in the windings is limited to values not dangerous to the insulation of the machine and the circuits.

In order to avoid the possibility of damage between the rotor core and end-caps by the heavy circulating currents induced under emergency conditions, some designs provide bonding-strips to ensure perfect contact between the end-caps and the body of the rotor.

Alternator-manufacturers sometimes prefer, particularly when laminated rotors are used, to quench the rotor-field more slowly, in order to prevent any voltage rise. It is then necessary to provide a discharge-resistance, which is connected across the winding before the exciter-circuit is broken. The flux in the rotor is maintained for a longer period under these conditions, and consequently the stator-voltage is maintained. This method is not recommended, because the stator-voltage may persist long enough to cause serious damage of the stator laminations.

An alternative method sometimes adopted with laminated rotors is to fit copper wedges in the winding-slots, and to short-circuit these copper wedges at each end of the rotor, so as to form a squirrel-cage winding, which affords a path of low resistance in comparison with that of the laminations. A suitable damping effect is thus obtained, and the field-flux can be rapidly reduced with safety.

Other methods are also employed to obtain equivalent effects, the principal difference in results lying in the "time-period" of flux maintenance and corresponding maintenance of stator-voltage.

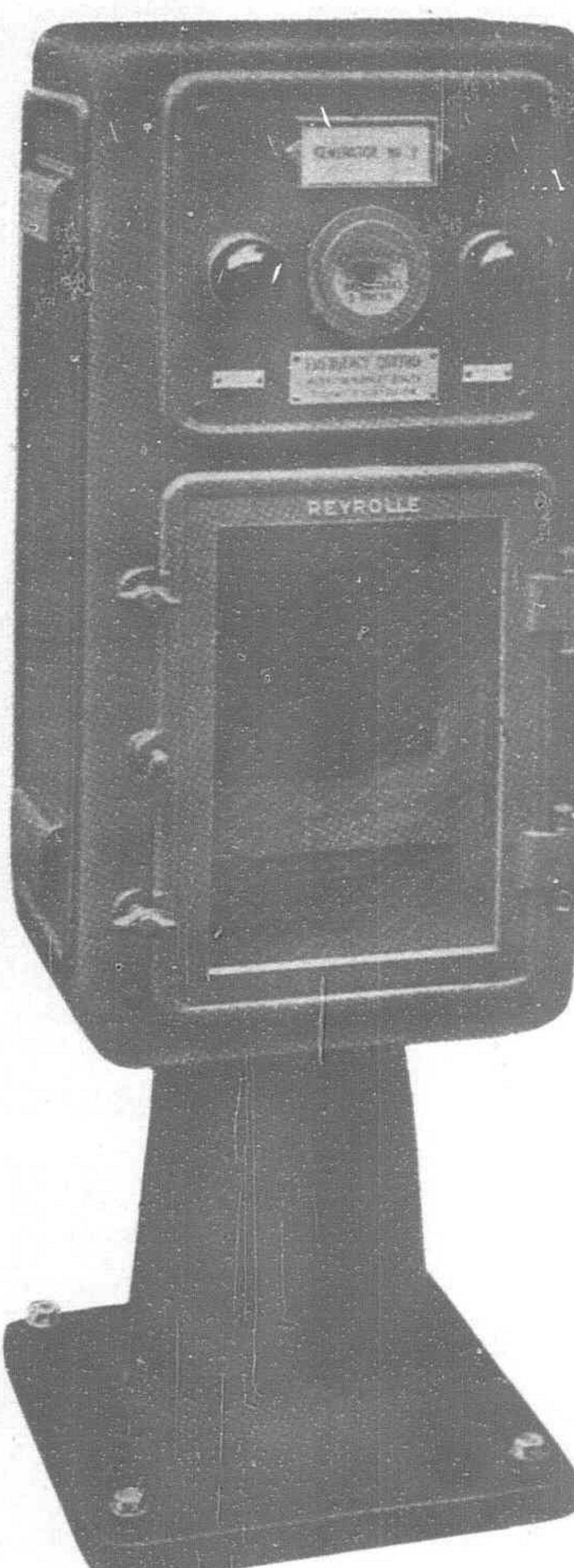


Fig. 1

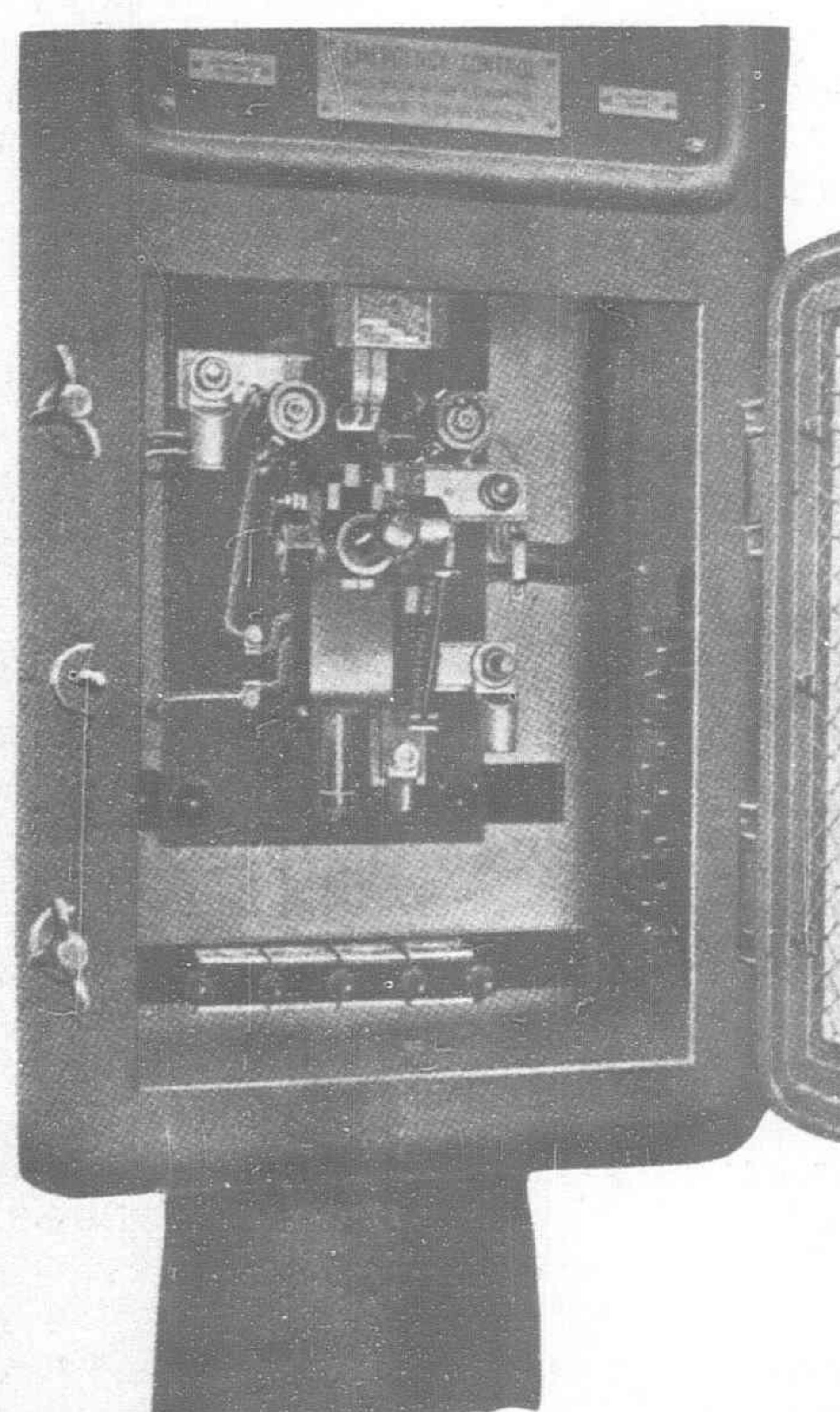


Fig. 2

## Requirements

It is desirable to secure the following conditions of operation:—

- (1) When a fault occurs on a stator-winding, the protective relay should immediately disconnect the alternator from the bus-bars, and complete the trip-circuit of the field circuit-breaker, which may be done by the closing of an auxiliary switch as soon as the alternator circuit-breaker contacts have separated.
- (2) It should not be possible for the field circuit-breaker to open until the alternator circuit-breaker has opened.
- (3) The field circuit-breaker should only operate on the occasion of an alternator fault, and not when the alternator circuit-breaker is operated deliberately, either in ordinary service or for routine testing.
- (4) The control-circuits should be so arranged that the field circuit-breaker must be closed before the alternator circuit-breaker can be closed, and the alternator circuit-breaker must be opened before the field circuit breaker can be opened.
- (5) If an emergency trip-device for the alternator circuit-breaker is provided in the engine room, as distinct from the control-board, the operation of this device should operate the field circuit-breaker as under fault conditions.
- (6) A further safeguard is to arrange for the alternator neutral circuit-breaker to open after the alternator circuit-breaker has opened because of fault-conditions. The neutral circuit-breaker should open simultaneously with the field circuit-breaker in emergency conditions, but must normally be capable of independent hand-control.

## Application

The above requirements can be readily met with Reyrolle standard apparatus, and reference to the diagram of connections shown in Fig. 3 will make the arrangements clear.

The protective relay is so designed that when it is operated electrically the three upper contacts shown in the diagram are closed, but when it is operated by hand the two lower contacts only are closed.

The various interlock-circuits are indicated, and the connections shown are such that the neutral circuit-breaker opens independently of the field circuit-breaker. A simple modification ensures a definite sequence of operation, if this is preferred.

A single-pole air-break circuit-breaker of the magnetic-blow-out type with a shunt trip-coil is used, and is very effective for the rapid quenching of the arc. This type of circuit-breaker is illustrated in Fig. 2, which indicates the usual method of mounting in a cast iron pedestal.

The circuit-breaker is usually arranged for hand-closing, and the operating-handle is accessible through the glazed door in the front of the pedestal. A remote-control circuit-breaker of the solenoid-operated type can, however, be fitted quite easily. The

- (a) Main bus-bars.
- (b) Main oil-break circuit-breaker.
- (c) Alternator cable-gland insulated from earthed switch-gear frame.
- (d) Self-balance current-transformers (secondaries connected to winding of relay F) for self-balance protection against cable-fault.
- (f) Relay, with armature operated upwards by self-balance protection, and downwards by hand release for routine testing. The latter does not trip the field switch.
- (g) Alternator stator-winding.
- (h) Solenoid-controlled oil-break circuit-breaker for neutral.
- (i) Neutral bus-bar common to all generators.
- (k) Earthing-resistance.
- (l) Closing-solenoid for neutral circuit-breaker.
- (m) Trip-coils for hand and automatic control of neutral circuit-breaker.
- (n) Exciter shunt-field regulator.
- (o) Alternator field circuit-breaker.
- (p) Trip-coil operated from relay F and emergency-switch S for field circuit-breaker.
- (q) Main circuit-breaker trip-coil.
- (r) Closing-solenoid for main circuit-breaker.
- (s) Emergency-control switch near alternator for opening main circuit-breaker, field circuit-breaker, and neutral circuit-breaker in succession.
- (t) Remote-control switch for main circuit-breaker.
- (u) Remote-control switch for neutral circuit-breaker.

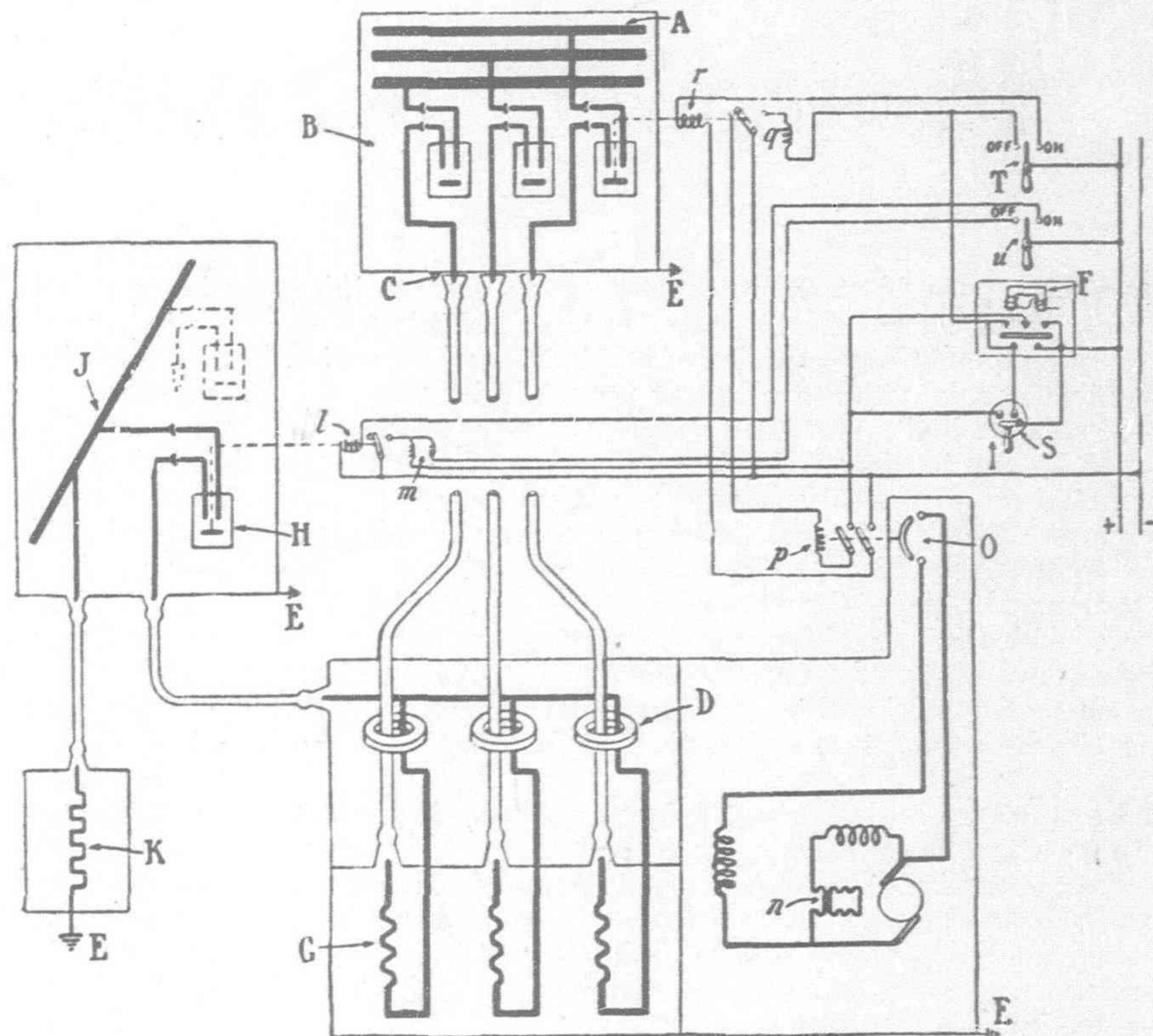


FIG. 3

arrangement is such that neither type can be opened by hand, but both must be tripped electrically, either from the relay or from the emergency trip-device. This prevents the inadvertent operation of the circuit-breaker while the alternator is on load.

The magnetic blow-out, or traction-type, circuit-breaker shown in Fig. 2 is sometimes replaced by a carbon-break circuit-breaker of the kind illustrated in Fig. 4. The arc is maintained for

a longer period with the carbon-break, with consequent maintenance of stator-voltage, and the quicker magnetic-blow-out break is therefore more effective.

When a discharge-resistance is necessary, as it occasionally is, to relieve stresses on the rotor insulation, the field circuit-breaker may be either of the air-break type or of the rotary-drum type, the contacts being so arranged that the resistance is connected across the rotor-windings before the exciter-circuit is broken. The air-break circuit-breaker is preferable for large alternators.

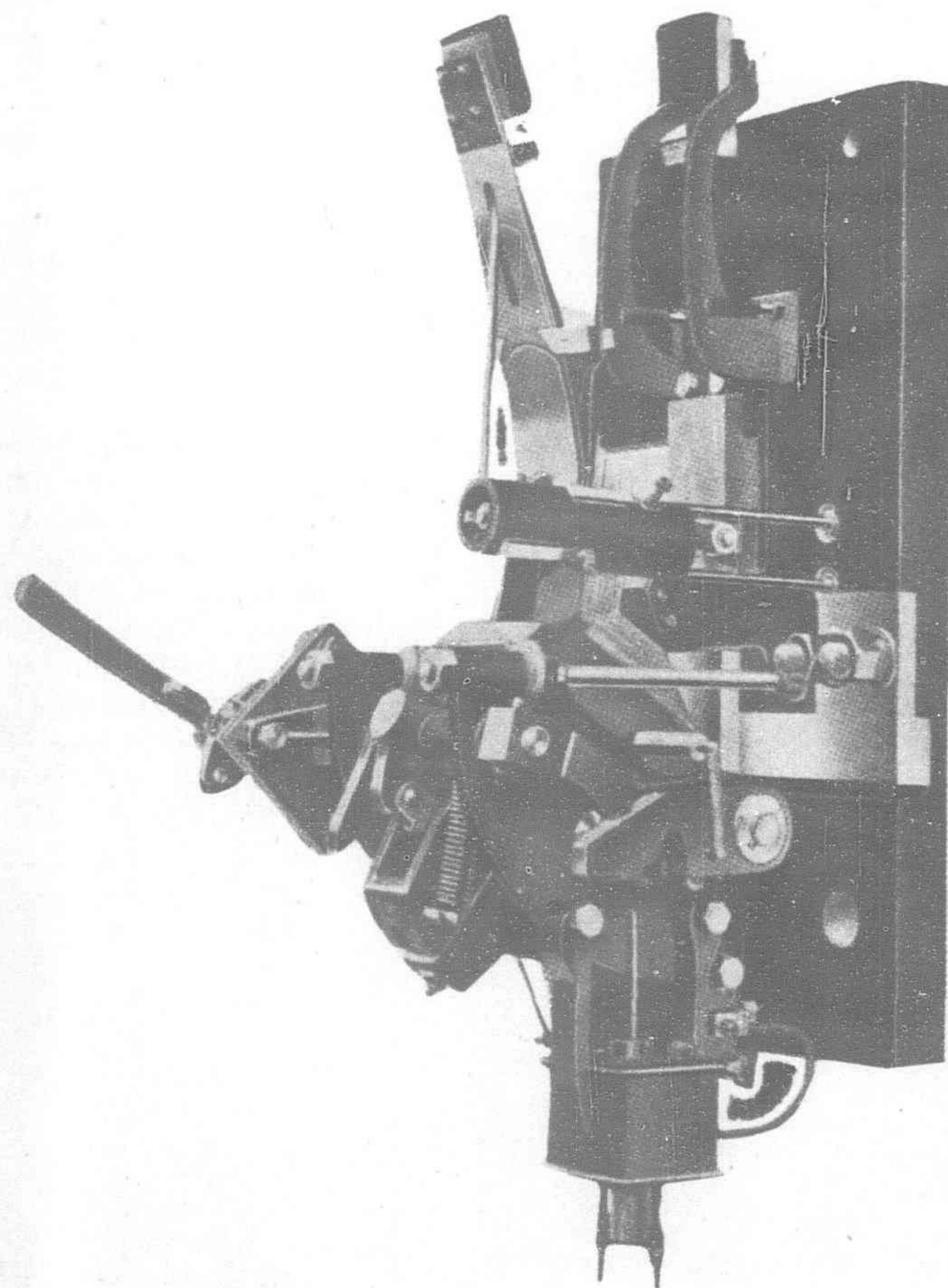
# Emergency-Control and Field Pedestal

The pedestal illustrated in Fig. 1 is a standard Reyrolle product, designed primarily for mounting near the alternator, either on the engine room floor, or on the alternator bed-plate next the exciter. This position reduces the length of the connecting cables to a minimum, and the pedestal is also convenient for accommodating indicating or control devices for the use of the engine room staff, such as :—

- (a) A load-indicator.
- (b) Colored lamps to indicate whether the alternator circuit-breaker is open or closed.
- (c) An emergency control-switch to open the alternator circuit-breaker and the field circuit-breaker.
- (d) A field ammeter.

The field circuit-breaker is totally enclosed in the cast iron pedestal, and sealing-bells are mounted in the base to take lead-covered cables. A cable sealing-box, combined with a terminal-board, is also provided for the multicore cable leading to the control-board. The continuous metalclad enclosure thus provided for is most important for safety and reliability.

Fig. 4



AN OMISSION.—It is regretted that owing to an inadvertent editorial omission proper credit was not given for an article on the subject, "Civil Aviation in the U.S.S.R.", which appeared in the June number of *The Far Eastern Review*. This originally appeared in the *British Russian Gazette and Trade Outlook*, published in London to whom acknowledgments are made.

# The Sewerage System of Tokyo

By W. HARVEY CLARKE, JR.

**F**OR a metropolis, in many ways, destined to assume third rank among her world compeers on October 1 of this year—boasting an official population of nearly five and a quarter million people within an area of almost eight times the present incorporated limits of 79,913 square kilometers—the city of Tokyo has an extraordinarily inadequate system of sewers and means for the effective disposal of waste matter, necessary to meet legitimate needs of sanitation and health among her inhabitants, is the belief of Mr. Zenro Hara, Chief Engineer of the Department of Public Works and Chief of the Tokyo Sewerage Works bureau.

Compared with other populous metropolitan centers, the absence in Tokyo of a network of modern sewers criss-crossing every section of the city offers the municipality a vital problem for solution—a problem dealing with the future no less than present welfare of the city.

Even into the farthest suburbs, efficient rapid transit services intersect Tokyo's area in all directions; while its city water is declared by expert authorities to be superior, in taste and freedom from bacteria, to the natural quality of waters used by many large cities in Europe and America. This is said to be due in part to a process of careful filtration to which Tama River water is subjected. Thus these extensive facilities for supplying pure water and furnishing fast transportation in Tokyo exceed conspicuously such insufficient equipment as has been provided to date for a sewerage system.

"Including some separated suburban communities, the entire drainage area of Tokyo proper to-day covers only about 20,335.33 acres (8,230 hectares), with a future population for the present city proper expected to reach 3,440,000 before long," Mr. Hara reported in a recent interview.

"Fulfilling a dual function, Tokyo's existing sewers convey rain as well as foul water through the same pipes, except in special cases when topographical conditions necessitate separate sewers. The maximum volume of sewage to be drained is based on the assumption that one-half of six cubic feet of foul water—the average quantity of waste daily per capita as estimated—will be discharged within eight hours; while the maximum rate for rain water is set at 50 millimeters per hour," Mr. Hara said. "Vitrified earthenware pipes less than 45 centimeters in diameter are used for sewers; precast, re-inforced concrete pipes for those up to 136 centimeters in diameter, and fieldcast, re-inforced concrete shapes for larger ones.

## Three Districts

"According to topographic features, the drainage area of the city is divided into districts 1, 2 and 3. The whole volume of sewage, along with a portion of surface water from each district, is carried by the main intercepting sewer to the respective disposal plants—Haneda for district No. 1 (now projected), Mikawashima for district No. 2, and Sunamachi for district No. 3—and thence it is discharged into river or bay, after undergoing filtration or chemical treatment for deodorization. Excess rain water collected by all the sewers is discharged directly by a relief outlet, or by means of pumps, into the nearest river or canal."

From the time of its foundation as a city in 1590—when Ieyasu Tokugawa made a pompous entry in establishing his Yedo

residence, plotted out streets, reclaimed marshlands for building lots, solicited merchants from other towns to trade in Yedo and, upon rebuilding the ancient castle, made Yedo the seat of the Bakufu government of his Shogunate—Tokyo has had open street drains by means of which surface and waste water has been discharged indiscriminately into moats, navigable canals, rivers and Tokyo Bay. For many years, as the city grew in population as well as in area, these drains developed without method, so that by their continued use sanitation and general hygiene became increasingly difficult.

After the fire of 1871, which wiped out practically all the business districts lining and adjacent to the Ginza thoroughfare, the construction of modern buildings began in Tokyo. With the appearance of Western structures came a demand for improved street facilities. In 1876 the necessity for modern sanitary devices received further consideration by the government and the people at large on account of a malignant outbreak of cholera, causing widespread consternation among the inhabitants. The outcry for an extensive water supply and sanitary sewerage system for the city became more and more insistent. Between 1883 and 1885 local authorities in Tokyo-fu, subsidized by the government, laid separate systems of sewers beneath the streets of Kanda ward, in the heart of the city.

In August 1888 the Street Improvement Committee of Tokyo was appointed. This committee named a subcommittee at once to investigate and study requirements for an adequate water supply as well as sewerage system for the city. The following year, in 1889, the submission of a report outlining a sewerage plan for a new and separate system was effected; but action was deferred because it was believed that the waterworks should be given preferential consideration to plans for the adoption of a new sewerage system.

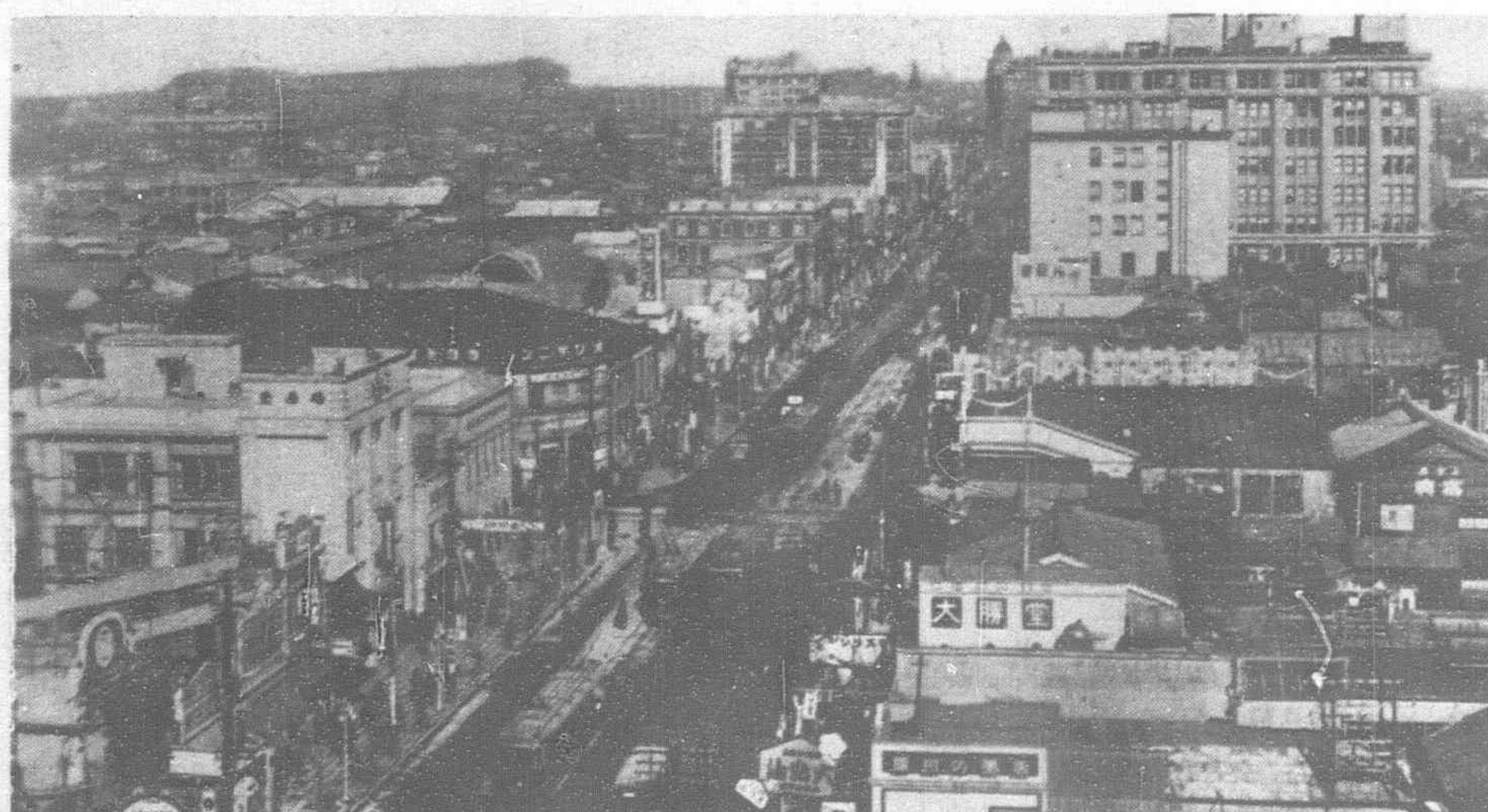
"When construction of the waterworks was substantially finished ten years later," Mr. Hara observed, "five years, from 1899 to 1904, was devoted to a thorough survey of prevailing conditions and needs of the city, in order to crystallize pending plans for the sewerage. A complete report presented to the Imperial government received its sanction and the municipality in April 1908 authorized the plans to be carried out.

"In June 1911 the city assembly voted to spend Y.6,130,000 in drainage district 2 in beginning work for the first undertaking, which was expected to last until 1918. The Ministers for both Home Affairs and Finance went on record as approving this action; and the government agreed to defray one-third of the estimated outlay needed. An office was opened and the work began in earnest.

## Progress Interrupted


"But in the wake of the upheaval brought about by the Great War in 1914," Mr. Hara continued, "the cost and term of the first undertaking were forced to be changed periodically, until settlement came with a total appropriation of Y.15,000,000 and an allotment of 12 years of labor, from 1911 to 1922. At last, what there is of Tokyo's modern sewerage system had its inception with the opening of the Mikawashima disposal works in March 1921 and the completion of the laying of sewer mains in district 2 within the ensuing year.

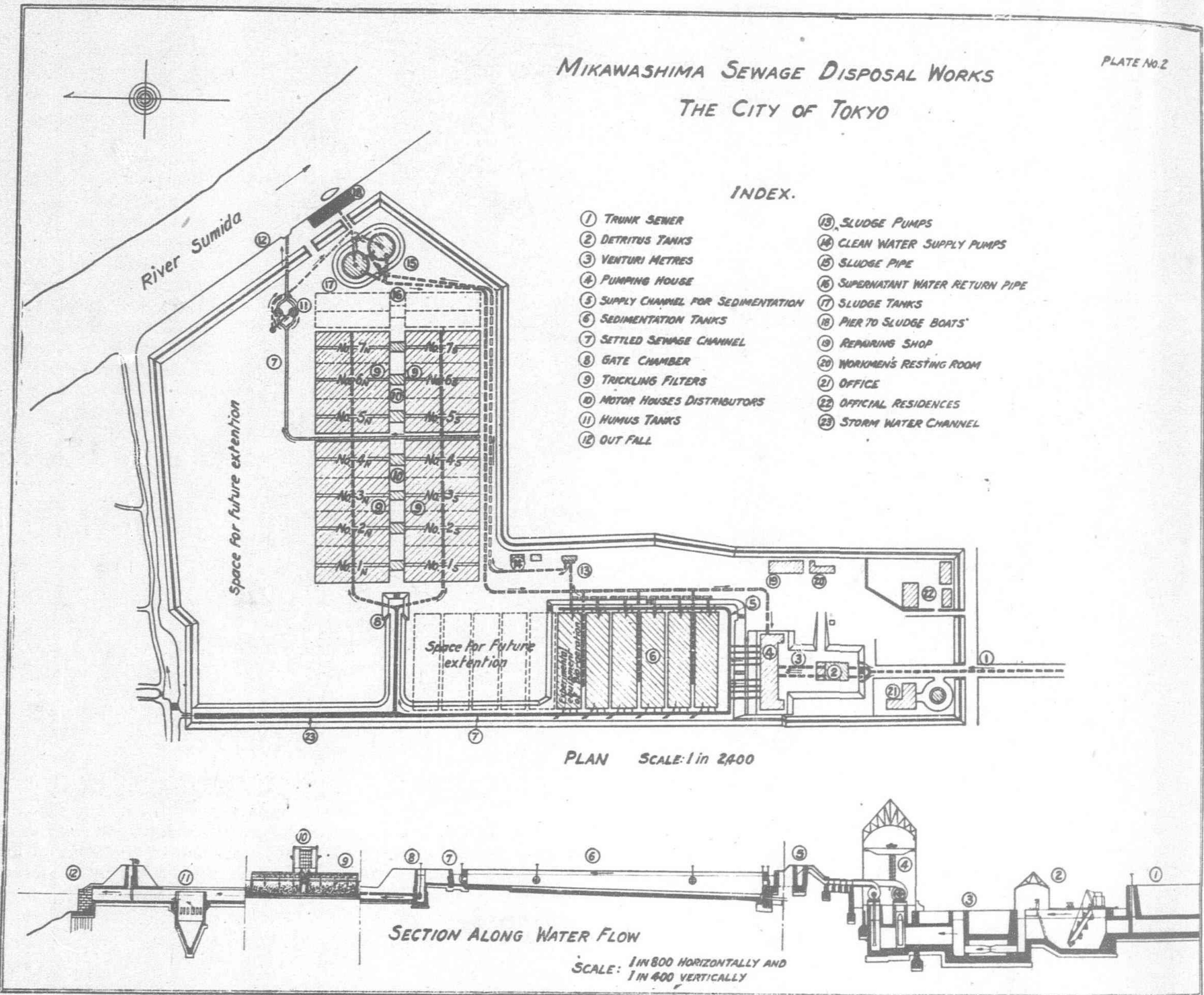
"Meanwhile in 1914, the city had begun additional work at an expense of Y.2,500,000



Along the Ginza in Tokyo's Business District

PLATE NO. 1





for eight different localities in district 1, which had suffered from frequent damaging floods. This work was completed in 1920.

General development in many quarters of Tokyo and its environs had become quite rapid by this time and the efforts of street improvement champions produced such favorable results that there arose the necessity of re-investigating the needs of the sewerage system, which had been emphasized so urgently back in 1908. After a thorough investigation for two years, plans for the future were revised to accord with opinions of the sewerage committeemen, who conferred again in 1921-22, under the approval of the government board of special city planning for the capital.

Consequently, as a second project, work for the low-level area of drainage district 1, covering the civic center of Tokyo, was commenced at a cost of Y.20,000,000, as a continuous undertaking to cover a period of eight years, from 1920 to 1927, inclusive. In the course of its progress, the severe earthquake and accompanying conflagration sustained by Tokyo and its vicinity, beginning at 11:58 a.m. on September 1, 1923, suspended work automatically for the time being. This catastrophe inflicted enormous damages upon the partially completed sewerage equipment.

However, as one of the reconstruction projects for Tokyo," Mr. Hara said, "work was re-commenced in November of the same year with a total sum of Y.43,500,000 for expenses, including the cost of work in other burnt areas of drainage district 1, together with main sewers, pumping stations and the Sunamachi disposal works in drainage district 3. Steady progress has been made since then and the Sunamachi plant was put into service in 1931.

During this same period, to prevent flooding in district 1, the city laid 20 mains in five years, from 1924 to 1928, inclusive, at a cost of Y.4,580,000.

Tokyo has already completed about 60 per cent of the original plans for an improved sewerage system, during the score of years since 1911, and has expended a total sum in excess of Y.90,000,000.

As a final undertaking, expenses to meet the cost of the entire sewerage system of Tokyo, according to existing plans, the project for the remaining extensions for district 1 and others, including the prospected Haneda disposal plant to be built in the southeastern part of the city, will require not less than an additional amount of Y.50,000,000 by the year 1945.

Designed to deal with a population of 2,170,000 and to accommodate a maximum d.w.f. (dry weather flow) of sewage, which comes to about 19,500,000 cubic feet daily, the projected Haneda disposal plant will be located near the mouth of the Rokugo River about 11 kilometers south of Shibaura pumping station, which will eventually be connected by pipeline with Haneda," Mr. Hara explained. "The works will occupy an area of 45.4664 acrea (18.4 hectares).

#### Present Installations

Principal installations will include four sets of detritus tanks and screens, pumping equipment with a total capacity of 450 cubic feet per second, having about 30 feet lift, 11 sedimentation tanks with a capacity of 3,500,000 cubic feet, a disinfection chamber with a mixing tank, etc. Settled sewage will be discharged into quick current off the coast of Haneda into Tokyo Bay.

"Construction on this plant is to begin within the near future. In the meantime, the sewage coming to Shibaura pumping station, from those parts of district 1 where sewers have been laid, is discharged into the bay at Shinagawa, after treatment by temporary installations annexed to this station.

"The Mikawashima disposal plant, for district 2, under operation since before the 1923 earthquake and the first one to be built, is located on the upper right bank of Sumida River and occupies an area of 45.7135 acres (18.5 hectares). This plant deals with a maximum d.w.f. of 2,760,000 cubic feet per day. Ample space is provided for future extension to deal with a population of 600,000 and a total d.w.f. of sewage of 4,140,000 cubic feet every day.

"Principal installations at Mikawashima comprise two sets of detritus tanks and screens, pumping equipment with a total capacity of 165 cubic feet per second, having about 28 feet lift, five sedimentation tanks with a capacity of 588,000 cubic feet, 28 trickling filters having an area of 308,000 square feet, with 14 pairs of sewerage distributors driven by electric motors, two humus tanks and two sludge tanks, etc. Effluent is discharged into Sumida River.

"Having gone into service in 1931 for district 3, the Sunamachi disposal plant is located on the lowlands of Tokyo at the mouth of the river Shin-Arakawa. It is designed to deal with a population estimated at 670,000. A d.w.f. of sewage amounting to 4,600,000 cubic feet a day can be handled.

"Principal installations are: pumping equipment with a total capacity of 1,533,000 cubic feet and two storage reservoirs for times of floodtide, high water, etc. Settled sewage is discharged into the bay at ebbtide.

"Drainage district 1 includes the wards of Shiba, Azabu, Akasaka, Kojimachi, Yotsuya, Ushigome, Koishikawa, Hongo,



The Pump House of the Narihirabashi Pumping Station in the Ward of Honjo

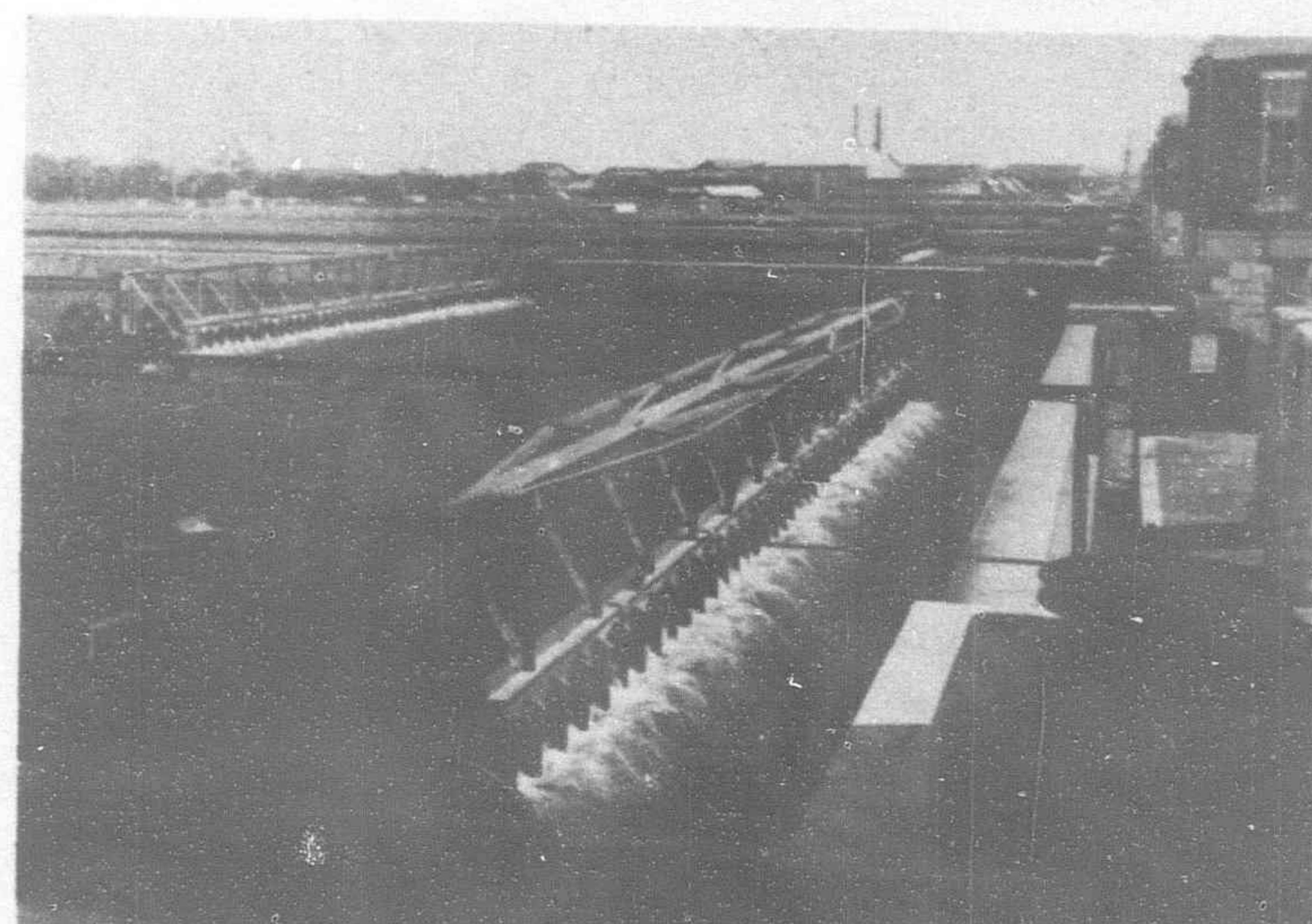
reaches Shibaura to join the delivery main of Shibaura pumping station, which is the trunk sewer for district 1, and will eventually lead from Shibaura to Haneda.

"The drainage area of this district is about 4,183.403 acres (1,693 hectares) with an estimated population of 400,000 and the total length of sewers will be nearly 751,120 feet (229,000 meters), of which about 118,080 feet (36,000 meters) have already been constructed.

"The middle-level area in district 1 includes the greater part of Hongo and some of Kojimachi, Ushigome, Yotsuya, Koishikawa, Kanda, Shitaya and Shiba. The main sewer of this district, after receiving the sewage from the low-level district at Otemachi, runs southward to Shibaura. Since the sewage of this district as well as that of the low-level areas is impossible to drain by gravity to the disposal works, Shibaura pumping station will provide an intermediate agency to lift the sewage to the trunk main that will run between Shibaura and Haneda.



Concrete Works on the Island of Tsukishima in Kyobashi Ward



Trickling Filter, Mikawashima Sewage-Disposal Works on Sumida River

Nihombashi and Kyobashi, the greater part of Kanda and some of Shitaya," Mr. Hara continued. "It covers a total area of about 15,206.534 acres (6,154 hectares) with an estimated population of 1,800,000. To facilitate drainage operations this district is subdivided into three parts or lesser districts, designated as high-level, middle-level and low-level areas, according to prevailing geographical conditions.

"The high-level district includes the wards of Azabu, Akasaka and some of Kojimachi, Shiba and Yotsuya. The sewerage in this district may be let to flow by gravity to the disposal works at Haneda when completed. The main sewer comes down a bore to the main of the middle-level district at Fudanotsuji, and there forming a two-story conduit

"With a population estimated at 730,000, the drainage area of this district is about 7,526.666 acres (3,046 hectares). The total length of sewers is 1,469,440 feet (448,000 meters) of which 265,680 feet (81,000 meters) have been laid.

### Further Details

"Tokyo's civic center comprises the greater part of the low-level area of district 1 and includes the wards Nihonbashi, Kyobashi (except the island of Tsukishima), some parts of Kanda and Kojimachi, and the low land bordering the river, Yedogawa. Sewerage is collected at the Zenigamecho pumping station by Gofukubashi near the central railway depot and pumped up to the force main, which converges with the main of the middle-level district at Otemachi.

"The drainage area of the low-level district covers about 3,493.994 acres (1,414 hectares) with an estimated population of 670,000. The length of its sewers total 951,200 feet (290,000 meters), of which 652,720 feet (199,000 meters) are laid.

"Zenigamecho pumping station, located in the first district, has an area of 3.37527 acres (1.37 hectares). Its chief equipment consists of a collective well, two detritus tanks with bucket dredgers and rotary screens and five centrifugal pumps with a total capacity of 160 cubic feet per second. The pump-house has ample space for the installation of three more pumps when necessary in the future.

"Shibaura pumping station is situated on reclaimed land known as No. 4 and occupies an area covering 4.4478 acres (1.8 hectares). The principal installations here are two sets of detritus tanks with basket dredgers and racks, and seven centrifugal pumps having a capacity of 195 cubic feet per second.

"As construction of the trunk main from Shibaura to Hanoda as well as the Haneda disposal works belong to plans for the future, arrangements for sedimentation and chlorination of sewerage from district 1 for temporary disposal at Shibaura are annexed to this pumping station for the time being.

"Drainage district No. 2," according to Mr. Hara includes the wards of Asakusa, Hongo and parts of Kanda and Shitaya, with an area of 2,038.575 acres (825 hectares). The future population of this district is expected to be close to 600,000.

"The main intercepting sewer runs northward to Mikawashima disposal plant, leaving the excess rain water to be drained by the Shinburi storm-water conduit, which is laid in parallel to the main sewer and leads to the outfall at Sanyabori.

"Tamachi pumping station in Asakusa ward, situated near the outlet of the storm-water conduit, is equipped with six large centrifugal pumps having a capacity of 600 cubic feet per second. In case of storms, when the water-level of the Sumida River is higher than that of the conduit, pumps are used to prevent flooding in the lowlands.

"Izumicho pumping station in Shitaya ward, built to serve the southern part of the second drainage district, is equipped with three



A Re-inforced Concrete Sewer Pipe

small sewerage pumps with a capacity of 18 cubic feet per second. The function of this establishment is to lift up sewerage from the remotest parts of the district into the main sewer.

"The total length of sewers in district 2 is about 908,560 feet (277,000 meters), of which 770,800 feet (235,000 meters) have been constructed already."

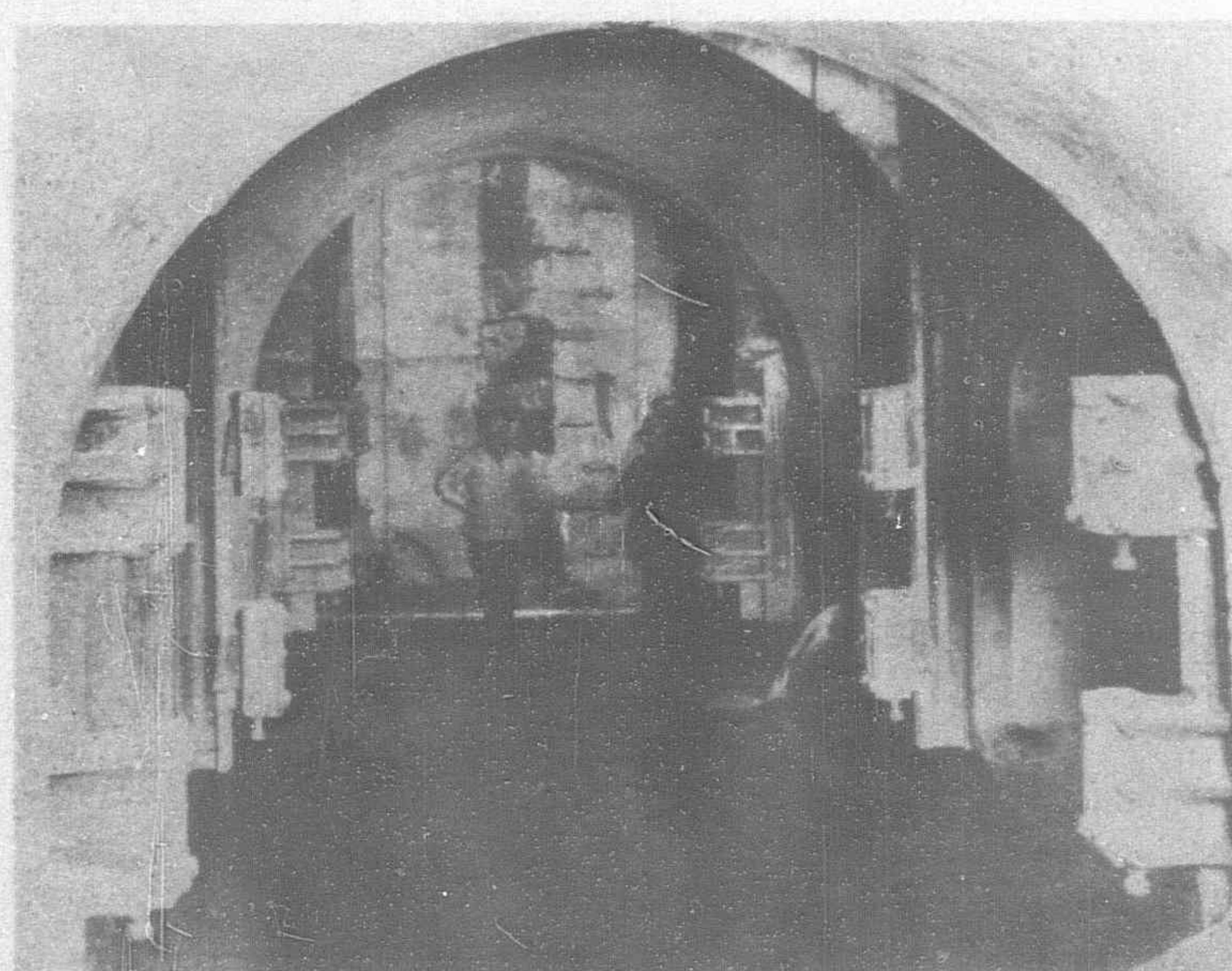
In conclusion Mr. Hara said: "Drainage district 3 covers the wards of Honjo in the north, Fukagawa in the south, the island of Tsukishima and Kyobashi ward east of Sumida River. These being the lowest districts in Tokyo, neither rain nor foul water can be discharged except in time of low tide.

"Three large pumping stations, Narihirabashi in Honjo, Kiba in Fukagawa and Sannohashi midway between them provide for drainage of surface water as well as foul water. When rainfall is heavy and the water-level of canals high, all surface and waste water collected at these pumping stations is discharged into canals by lifting through action of stormwater pumps. Some of these pumps have diameters of 45 inches. Foul water together with some rain water is pumped up into the main sewers connecting each pumping station and thence by the sewerage pumps carried away until it reaches the final disposal plant at Sunamachi.

"A pumping station, smaller than any of the others, is yet to be installed on Tsukishima to force up local sewerage into the main sewer in Fukagawa ward.

"The total area of the third district is approximately 3,093.692 acres (1,252 hectares). This district has a population estimated at 670,000. The total length of its sewers is 1,101,920 feet (339,000 meters), of which about 318,160 feet (97,000 meters), including all main sewers, are under construction.

"Narihirabashi pumping station, in the northern part of this district, is to be installed with six large storm-water pumps altogether. Then a total capacity of 560 cubic feet per second will be available. Four sewerage pumps with a total capacity of 44



The Pumping Well, Mikawashima Disposal Works on the Right Bank of Sumida River

(Continued on page 485).

## A Notable Record

THE following extract from the British Association of Japan's Quarterly Letter to members, April-June, 1932, may be of interest. The accompanying photograph is of the 40,000 kw. 2-cylinder set at the Nippon Denryoku station at Amagasaki.

An indication that the Japanese engineers are fully alive to the necessity for installing the most up-to-date plant and that they realize that the home of steam engineering, as that of the steam engine, is in England, is evinced by the fact that during the last eighteen months the Metropolitan-Vickers Electrical Co., Ltd. has completed installations of steam generating plants amounting to no less than 160,000 kw.

The world tendency to operate at the higher limit of the steam cycle within the limits of the development of materials is shown by the following table:—

### SHORT LIST OF IMPORTANT INSTALLATIONS BY METROPOLITAN-VICKERS ELECTRICAL CO., LTD., ENGLAND

Supply Co.	Rating	Steam Press	Steam Temp
Kobe Municipality	12,500	230	650°F.
Nippon Denryoku (Amagasaki)	2 x 25,000	250	606°F.
Kyushu Denki Kido	12,500	350	700°F.
Nippon Denryoku (Amagasaki)	40,000	250	606°F.
Nippon Denryoku (Tsurumi)	2 x 35,000	350	700°F.

40,000 kw. 2-cylinder Set Installed by the Metropolitan-Vickers Electrical Co., Ltd. at the Nippon Denryoku Station at Amagasaki

Supply Co.	Rating	Steam Press	Steam Temp
Nankai Tetsudo	12,500	300	722°F.
Sanyo Chuo	38,500	600	*725°F.
Kyushu Denki Kido	2 x 27,000	500	750°F.

\* Steam reheated to 480°F. between the h.p. and l.p. Cylinder.

## Sulzer Engines in Chinese Mills

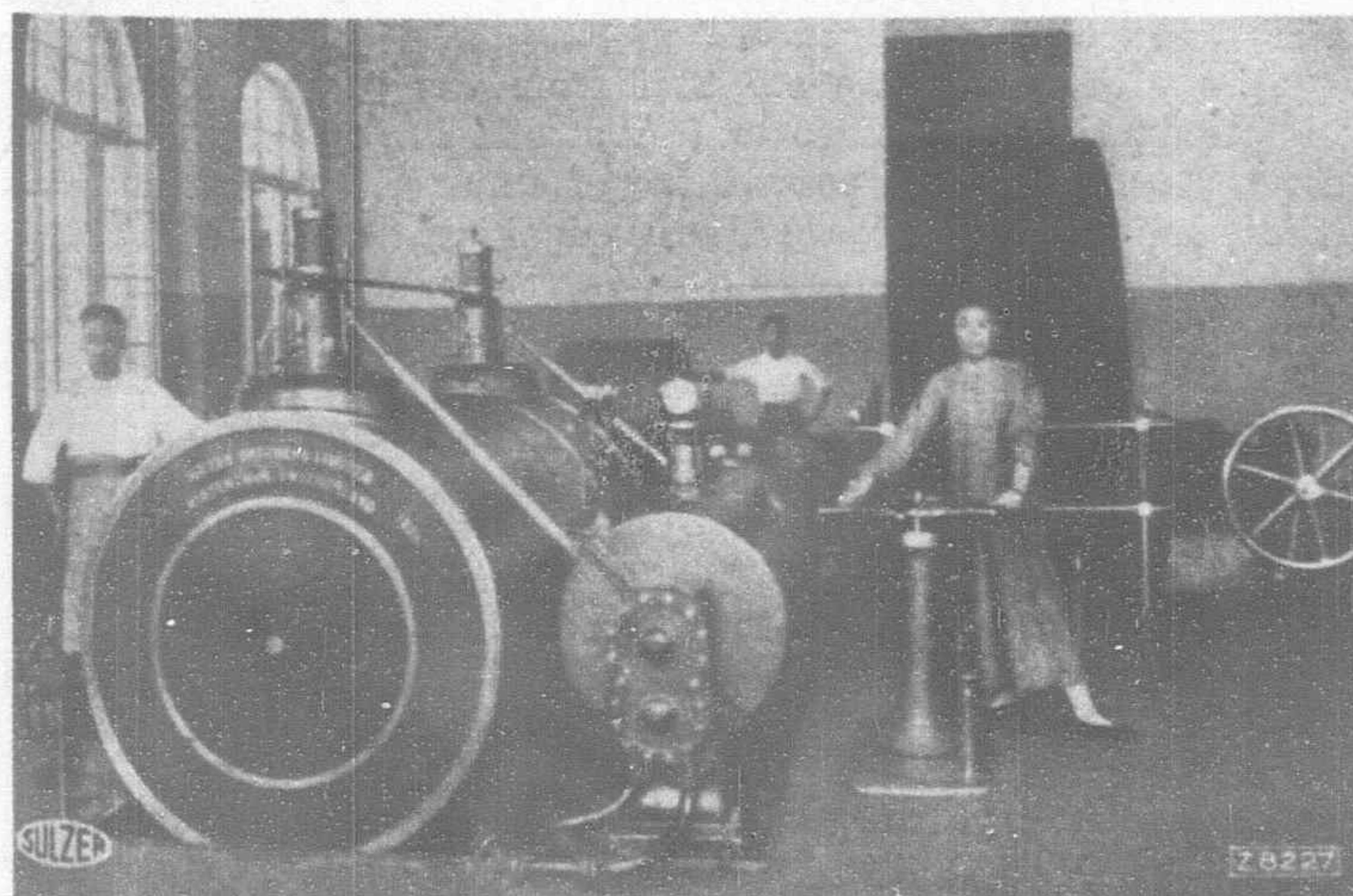
The Chen Foong Flour Mill in Tsinanfu, the chief town of the province of Shantung, was until recently driven by an old compound expansion steam engine by other makers ; it worked condensing, with saturated steam at a pressure of 150-lb. per sq.-in. A short time ago the mill was extended, and the steam engine was no longer powerful enough to comply with all requirements. It has therefore been replaced by a Sulzer uniflow steam engine of 850-b.h.p. which works with steam at a pressure of 170-lb. per sq.-in. and a superheat temperature of 550°F.

The old steam engine drove 12 corn-grinding mills, whilst the new one drives 19. After the new steam engine had been installed, the production of flour could be increased from about 4,500 to 7,000 sacks per day of 24 hours. For this production, however, the output of the steam engine is still too large ; it consequently

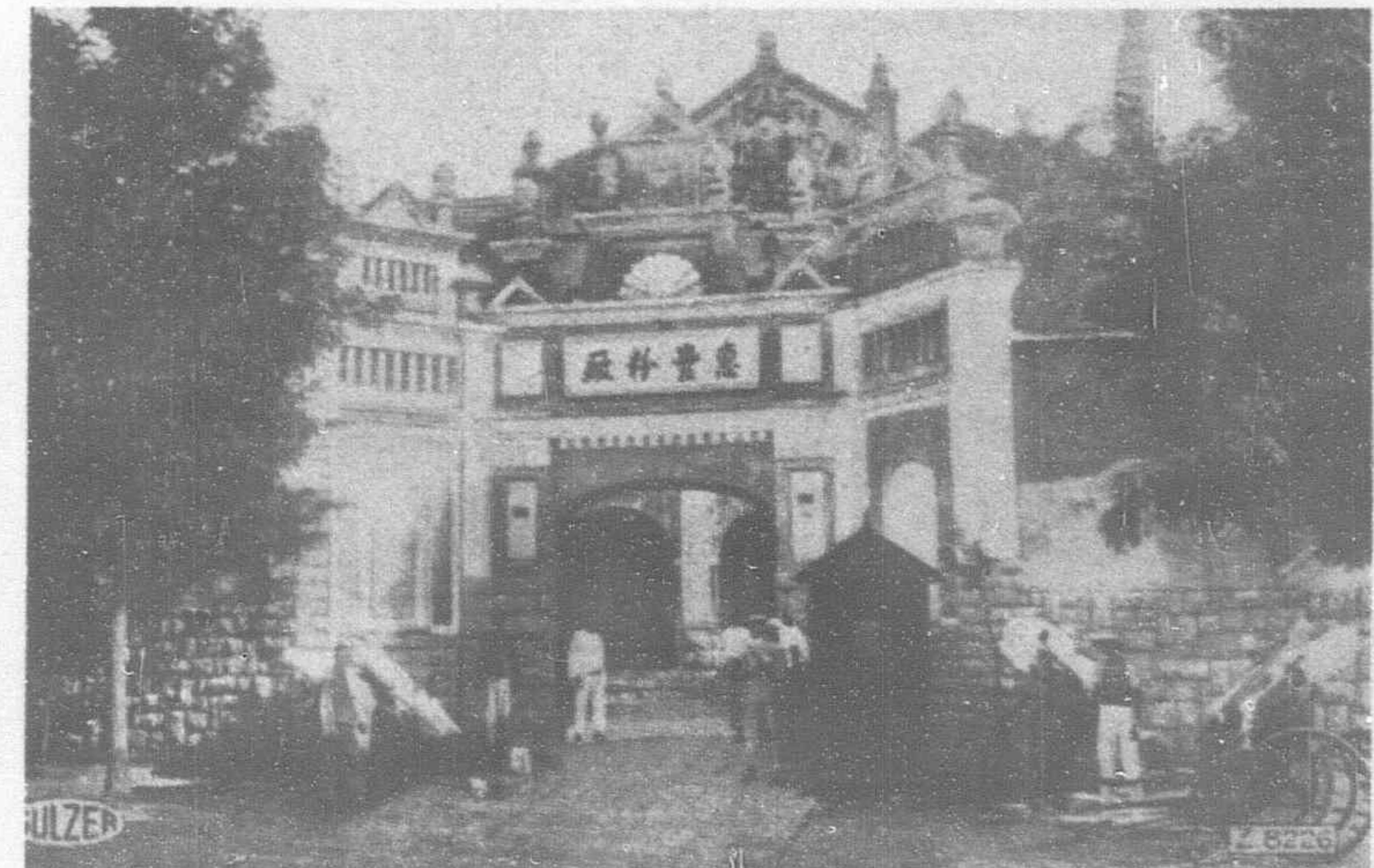
works at present only with about half load. The engine was intentionally chosen so large, since it is intended to extend the mill in the near future, and the steam engine shall also then be sufficient for the extra work required.

At the end of the shaft of the steam engine a flange is fitted to which a generator will later be coupled ; this will provide the electric energy for the extended installations. The present grinding mills are driven by rope through shafting, but it is intended later to install grinding mills driven by electric motors.

Below is another flour mill in Tsinanfu, the Wei Foong Flour Mill, which was erected a few years ago on the site occupied by an old mill which had been destroyed by fire. In this case power is supplied by a Sulzer uniflow steam engine of 350-b.h.p., working with steam at a pressure of 170-lb. per sq.-in. with 570°F. of superheat.



Engine room of the "Chen Foong" mill in Tsinanfu, China. Sulzer steam engine, 850 b.h.p. at 150 revs. per min., initial steam pressure 150 lb. per sq. in., temperature 545°F.



"Wei Foong" mill in Tsinanfu, China, equipped with a Sulzer steam engine developing 350 b.h.p. at 165 revs. per min., initial steam pressure 170 lb. per sq. in., temperature 570°F.

# The Gold Mining Industry in Soviet Russia\*

By L. SHLOUNDE, M.Sc., F.C.S., M.I.M.E.

(The following article is supplementary to an article under the same title by the author that appeared in *The Far Eastern Review*, July, 1932)

**H**AVING described in a previous article the principal gold districts in the Urals and Siberia, the exploitation and production of gold for a period of half-a-century, I propose to give a general survey of the economic importance of the gold-mining of the U.S.S.R. in world economy.

Gold as a metal has been considered "precious" from ancient times up to the present day. In the present stage of technical development and chemical knowledge the metallurgy of gold becomes one of the most important industries. Gold is an important commodity not only for its technical and chemical properties, utilized in technology, dentistry, jewellery and ornamental articles of luxury, but in society has become the most important commodity in the world economy, a standard for the monetary system of national and international credit and exchange. As such gold practically controls the stability of international trade and commerce. For this reason the gold industry, and with it, gold mining, becomes one of the most essential elements in the economy of the capitalist world.

The importance of the gold mining industry in colonization and colonial expansion is enormous. Every discovery of gold in a remote or deserted country has been followed by a rush of new population and the formation of new centers of civilization.

The following figures show the World Gold Production :

Years	Gold production in kilogrammes	Yearly decrease in % to 1913
1913	708,800	100%
1918	598,500	84.1%
1923	552,100	77.9%
1924	591,900	83.5%
1925	596,000	84.0%
1926	601,800	84.9%
1927	603,400	85.1%

Average decrease for 14 years, 83.3%

From the above table a decrease of 16.7 per cent or one-sixth of the general world production of gold is apparent. This is mostly due to the exhaustion of gold placers and mines, the impoverishment of gold values in the existing ores, shortage of labor, increasing cost of mining materials, and of the general cost of production in comparison with pre-war conditions of the industry.

## DISTRIBUTION OF THE GOLD PRODUCTION IN PRINCIPAL COUNTRIES OF THE WORLD.

(in kilogrammes)

Countries	1913	1925	1926	1927	Production 1927 in % to 1913	
					1913	1913
S.Af.U. (Transvaal)	273,700	298,500	309,900	314,500	114.9	
U.S.A. (America)	133,700	75,000	69,600	65,900	49.3	
Canada	25,000	54,000	54,600	57,400	229.6	
U.S.S.R. (Russia)	60,900	10,900	30,900	33,000	54.2	
Mexico	25,800	24,500	24,000	22,600	87.6	
Australia	68,700	17,400	20,300	20,000	29.1	
Totals	587,800	480,300	509,300	513,400	87.3	
In % to world production	82.9	80.6	84.6	85.1	—	

The gold production of the above six countries represents four-fifths of the total world gold production. They were the most important sources for the supply of gold to the world market.

## SPECIFIC WEIGHT OF GOLD PRODUCTION OF THE PRINCIPAL COUNTRIES OF THE GOLD MINING INDUSTRY (in %)

Countries	1913	1927
U.S.Af. (Transvaal)	38.6%	52.1%
U.S.A. (America)	18.9%	10.9%
Canada	3.5%	9.5%
U.S.S.R. (Russia)	8.6%	5.5%
Mexico	3.6%	3.8%
Australia and N.Z.	9.6%	3.3%

The Transvaal occupies the first place in the world gold production. This is due to the high capitalization of the industry, large plants and works, high mechanization and technical application of specialized machinery of high productivity, chemical and metallurgical processes for perfect extraction of gold from the ores, tailings and slimes and perfect mechanical appliances for same, also the permanency of the gold reefs of payable ore, deep mining (up to 2 kilometers), intensive exploitation and plentiful supply of cheap native labor—180,000 kaffirs and about 20,000 skilled miners, mechanics, engineers, chemists, metallurgists and highly qualified specialists and experts.

There are most serious indications that the gold mining industry of Witwatersrand, the principal gold mining district of South Africa, has reached its limit and that in the future it may greatly decrease and its production will be exhausted in many areas unless new payable fields can be discovered. After calculations made by R. P. Kotze, State Chief Mining Engineer of South Africa, the production may greatly decrease by 1936 against 1924 by 48 per cent. Professor S. Kassel considers that the life of the Rand mines in Transvaal will not exceed fifteen years.

The U.S.A. occupied the second place in the world gold production, which in 1913 produced one-fifth and in 1927 about one-tenth of the world gold production. This means a production decreased by half. This catastrophic fall in the U.S.A. gold industry was alarming on account of the decreased yield of the mines and thus caused a substantial gap and deficiency in the world gold supply and a considerable financial disturbance in the economic life of the United States of America.

Australia also had a sharp decline in its gold production to one-third of its previous output: from 9.7 per cent in 1913 to 3.3 per cent in 1927. This heavy decline was a heavy blow in the national economy of Australia.

There is only Canada, with its great possibilities in gold mining and considerably increased production from 3.5 per cent in 1913 to 9.5 per cent in 1927.

From the above we see that from the present sources the gold production of Mexico and Australia have decreased, South Africa stands before a perspective of exhaustion, West and East Africa, including Madagascar, are insignificant and now explored; only Canada, Russia and Siberia have the utmost chances and prospects for great future development of the gold mining industry.

From the total gold production of 616,300 kilos, in 1928, South Africa stands with 322,800 kilos, Canada 57,200 kilos, Australia 19,800 kilos and Mexico with 18,300 kilos.

Gold in the world economy has a double designation and application: 40 per cent of the gold total production is used in industry; but its largest part (60 per cent) is used in circulation as currency, in form of specie (coined gold) and bullion (uncirculated gold).

The transition of all the most important capitalist States to the gold standard or in countries financially advanced to the recognition of gold as the leading currency, increased the quantity of gold required, in order to meet their system of credit and exchange. In conjunction with this there took place a considerable

increase of gold reserves, concentrated and centralized in the banks, forming reserve funds for international financial settlements, payments in species, as well as for internal currency or exchange for creditable bank notes, treasury notes, or paper money.

The world reserves of gold in specie and bullion in the central banks and State treasuries of exchequers are as follows:—

Years	Reserves in mill. dollars	Percentage to 1913
1913	4771.1	100
1918	6756.7	141.6
1923	8570.0	179.6
1927	9203.0	192.9

Thus the reserves of gold for the period of fourteen years nearly doubled.

#### GOLD RESERVES CENTRALIZED IN THE PRINCIPAL STATES

(in millions of Dollars)

States	1913	1927	Increase in %
U.S.A. . .	1290.4	3977.2	+ 208.2
England . .	170.2	741.7	+ 335.8
France . .	678.9	710.4	+ 4.7
Japan . .	65.5	541.7	+ 733.4
Spain . .	92.5	502.5	+ 443.2
Argentine . .	225.0	460.8	+ 104.8
Germany . .	278.7	444.2	+ 59.4
Total . . .	2800.2	7378.5	+ 163.4
In % to world reserves.	58.7	80.2	—

The concentration and centralization of gold reserves in one or another single State increase its economic and political power and lead practically to a financial dictatorship in the world economies, ultimately causing most dangerous financial crises in the economic life of nations.

#### SPECIFIC WEIGHT OF GOLD RESERVES IN PRINCIPAL STATES AND PERCENTAGES OF THEIR RELATIVE INCREASE IN THE PERIOD 1913-1930

States	1913	1927	1930
U.S.A. . .	27.1	43.2	60%
England . .	3.6	8.1	8%
France . .	14.2	7.7	27%
Japan . .	1.4	5.9	—
Spain . .	1.9	5.5	—
Argentine . .	4.6	5.0	—
Germany . .	5.8	4.8	—

With regard to the gold mining industry of U.S.S.R., it must be said that while in many industrial branches the U.S.S.R. reached the pre-war level, its present gold production represents only 54.2 per cent of the pre-war output, although with regard to extension and gold values, the gold mines and alluvial fields of Russia and Siberia surpass many other gold-bearing countries. The main reasons for the fall in production are the Great War of 1914-1918, the civil war in the Urals and Siberia, the prolonged period during which the Far East was cut off from the main territories of the Soviet Republic, the war of intervention. There were many other reasons for its decline. Had it not been for this decrease, the production in the U.S.S.R. would be normal and regular and she would to-day probably be producing gold on a scale as to remove all anxiety regarding the future supply of this highly important precious metal.

In 1920-21 the Russian gold mining industry practically ceased work and only in 1922 did it start by degrees to increase. Through great efforts the regular production has been restored and the industry re-established, and progressive output is to be expected in the near future, as a result of the next projected Five-Year Plan.

The previous difficulties which hindered the rapid development of gold mining were the distances and remoteness of the rich gold-bearing districts from the centers of other industries. The absence of suitable ways of communication, such as railways, navigable rivers, etc., which made expensive the delivery of machinery, materials and supplies of stores and provisions. For example,

there is Vitim-Olekmansk, a rich gold region, at a distance of 1,000 kilometers from the nearest railway. There is also a great deficiency of modern machinery, scarcity of qualified and experienced technicians, skilled workers, practical engineers, metallurgists and miners with full knowledge of the gold industry. This created great difficulties in the past and led to the lack of a regular organization of scientific and technical exploitation of many gold regions. The most characteristic feature of Siberian gold mining is its present method of exploitation; the predominance of manual labor over the mechanization of working processes; the manual working of alluvial gravels by so-called "Staratelis," a system of individual labor enterprise by contractors, exerting the utmost efforts of production from individual diggers and washers of alluvial gold gravel. By this system of manual work a large amount of gold is lost; only heavy gold and nugget are recovered, but a great deal of fine gold is lost in washings. Up to now by the system of "Staratelis" about 50 per cent of the gold production has been recovered and only 40 per cent of the gold production has been obtained by large private industrial enterprise. Under the present circumstances the individual enterprise by the system of "Staratelis" is compelled to continue, until the whole gold mining industry can be organized by trusts, as a socialized industry under the control of the State.

#### THE IMPORTANCE OF THE GOLD MINING AREAS OF THE U.S.S.R. IN PERCENTAGE TO THE GOLD PRODUCTION OF THE U.S.S.R. IN THE YEARS 1926-1927, is shown in the following table:—

The Urals . . . . .	11.6%
Siberia and Kazakstan . . . . .	10.4%
Lena Region . . . . .	40.9%
Aldan . . . . .	20.0%
Far East . . . . .	17.1%

This table shows that the Lena and Aldan regions produced about two-thirds of the whole present production of U.S.S.R. Of the whole production 17 per cent is mining and 83 per cent alluvial gold.

The economic importance of the gold-mining industry to U.S.S.R. is very great at present. Soviet Russia requires gold for her foreign exchange, for direct payment and settlement of her foreign accounts.

The Soviet State, holding and controlling the most important key industries of the whole Soviet Union, and centralizing its interior exchange and currency, can dispense with gold internally, and requires it only for her foreign exchange, trade, etc. This is the main reason for her vigilant attention to the development of her gold-mining industry. A great deal is done at present in the exploitation of alluvials, by introducing new dredging operations in the gold-bearing rivers, and granting privileges and long-term credit to private enterprise of "Staratelis," increasing wages and paying higher prices for their output, exemption from local taxes, etc. Every measure is taken to prevent and eliminate the illegal working and dealing in gold or any other precious metal; also all measures are taken to improve the social life of the diggers and workers. The importance of manual (muscular) exploitation of gold mining can be seen from results of the year 1926-1927, showing the percentages of extracted gold by the following methods:—

Mining . . . . .	6.7%
Chemical extraction . . . . .	1.9%
Metallurgical processes . . . . .	8.3%
Dragging processes . . . . .	5.7%
Hydraulic processes . . . . .	0.6%
Manual (muscular) . . . . .	76.7%

#### Future Prospects in the World Gold Industry

The gigantic growth and progress of the world's trade and industries, the introduction of the gold currency and the adoption of the gold standard in Europe and America, its forthcoming introduction in the growing countries of Asia, Africa and Australia will considerably increase the financial need for gold. According to the calculations of Prof. Kitchen, the essential conditions of the development of world economy requires a yearly increase of the world's gold reserve of 2.7 per cent. In the course of ten years from 1926 to 1935 the average yearly accumulation in the monetary gold reserve, according to his calculations, will represent £64 million, but the expected production of gold for that ten years

period is 55 per cent less than the normal amount required. The reason for this discrepancy lies in the exhaustion of many present gold-producing countries. The rich goldfields of the U.S.S.R. will therefore be the most important available sources for gold production for the world gold market. The decline of the gold reserve in consequence of the decrease of the world's gold production has evoked great alarm and anxiety because the gold currency represents the most pre-eminently important currency in the present actual form of exchange in all capitalist States.

The suggestion of some economists to dispense with gold, as a measure of values and as a token of wealth, on account of its intrinsic and exchange value, has no economic ground whatever. In the capitalist system of finance the only possibility would be to withdraw gold from the interior circulation of a State; but at present no economic force can dethrone gold and the standard as a world currency from the general and international money markets of the world. From the point of view of economic science the gold and gold standard in the present system of society is the only solid foundation upon which the credit of nations and States can be maintained.

### The Gold Reserves of the U.S.S.R.

The general gold reserves in U.S.S.R. of gold, of ores, minerals, alluvial and gravels in its gold-bearing areas are as follow:—

Actual reserves from minerals and ores.	121,820 kilos of gold.
Prospective reserves from minerals and ores	530,000 " "
Actual reserves from alluvial and gravel.	173,810 " "
Prospective reserves from alluvial and gravel	4,117,400 " "
Total of actual and prospective reserves.	4,942,530 kilogram gold
Equal to	160,081,613 troy ozs. gold
Approximate value at £6 per oz.	£960,489,268

In my article on the gold mining industry of the U.S.S.R. I have fully described the gold mining of Russia and Siberia, its development and progress, its production and reserves, its worldwide economic importance in the financial world of nations. I have demonstrated its past and still more its future prospects. In view of the alarming decrease and exhaustion of many other gold-bearing countries, I have described the inexhaustible sources of previous gold reserves in many explored territories of Soviet Russia, and I must conclude by saying that the gold treasure of Russia and Siberia has so far only been partially estimated. Its soil, the richness of which is renowned the world over and its mineral wealth is waiting for the necessary capital, enterprise and knowledge, and there cannot be any doubt that the mining world of Europe and America, and particularly England, will sooner or later be convinced of this fact. It should be borne in mind that the gold mining industry of South Africa was developed by Great Britain and British capital in the mutual interest of both South Africa and Great Britain.

The time is now approaching for us to realize the potential power which lies for British capital as a pioneer in the future exploitation of the immense goldfields and mineral resources of the territories of the Union of Soviet Russia.

At present Soviet Russia is concentrating all the State resources on agriculture and heavy industries, such as iron, steel, oil, chemicals, metallurgical, electrical and constructive works, and although she has brought up the gold industry to the pre-war conditions, and serious attention is being given also to the gold industry in the next Five-Year Plan, it must be recognized that foreign investments in Russian mining could be only welcome.

If Great Britain, as the classical pioneer of gold mining, would provide industrial and financial capital, she would not only obtain a beneficial return on her investments, but at the same time, it would open new markets for British goods, machinery, railways, etc. But, above all, it must not be forgotten that the peaceful penetration of foreign capital for development of the gold mining industry of U.S.S.R. would make it possible for Russia to export gold on a large scale for the requirements of the financial world. This would prevent further financial crises and would open up a new era of prosperity to the world at large.

### The First Baldwin Locomotives for Persia

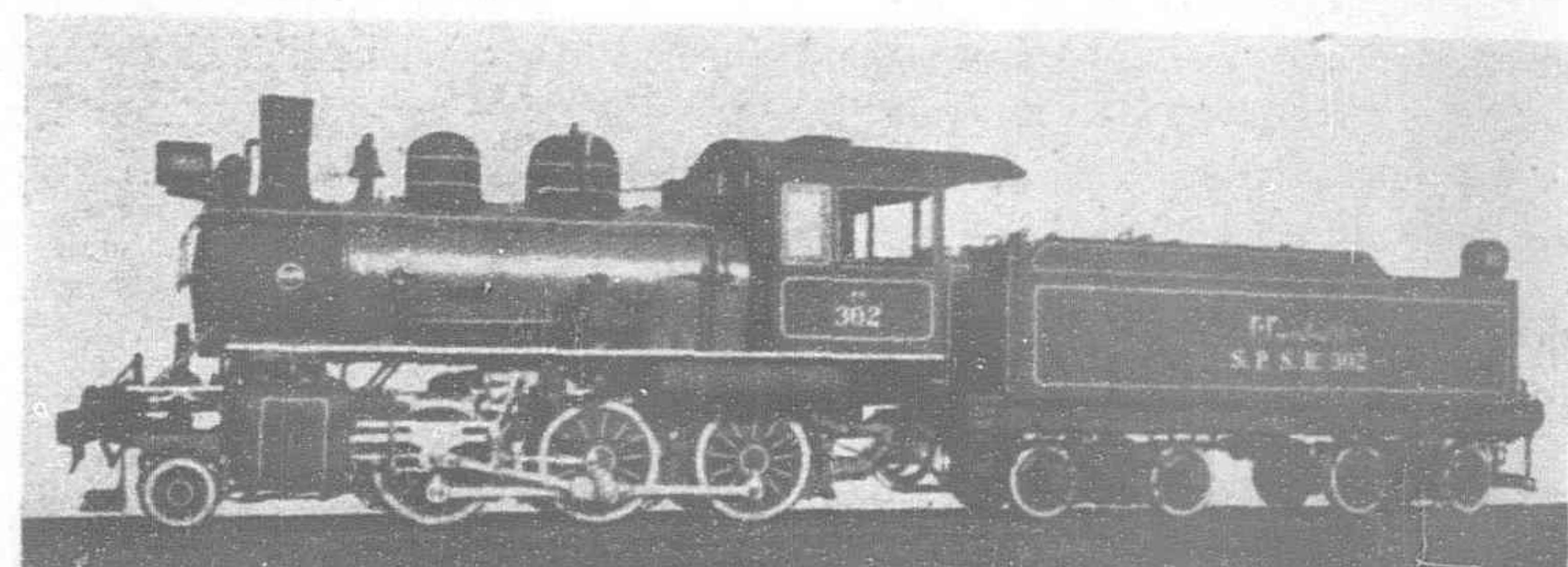
THE Government railways of Persia are divided into three sections, which are separated from each other geographically by wide expanses of mountainous country. These mountains are so formidable that Teheran, the capital of Persia, has no railroad connection with the outside world.

The Southern Persian State Railway extends from Bandar Shahpour, at the head of the Persian Gulf, north to Dizfu 251 kilometres inland.

The Northern Persian State Railway runs from a point on the Caspian Sea near Bandar-i-Gaz, almost due west to Aliabad, a distance of 133 kilometres. Both the northern and southern sections have a track gauge of 4 feet 8½ inches.

The third section of the Government railway system starts at the Armenian border and extends from Julfa to Tabriz, a distance of 147 kilometres. A branch line 52 kilometres in length connects with the main line at Sufian and runs to Sharafkhaneh on Lake Urumiyeh. This entire section has a track gauge of 5 feet.

The Government system together with 15 or 20 kilometres of privately owned lines, constitute the only railways in Persia. A line, 1,216 kilometres in length, to connect the northern and southern sections of the Government railways, has been projected but there seems to be no immediate prospect of its construction being undertaken as it presents many engineering difficulties and would necessitate the building of scores of tunnels.



One of Four Locomotives Recently Built for the Southern Persian State Railway

Track gauge	4-ft. 8½-in.	Drivers, diam.	46-in.
Cylinders	16-in. by 22-in.	Weight on drivers	76,600 lb.
Steam pressure	175 lb.	total engine	91,500 lb.
Heating surface	1,017 sq. ft.	Tractive force	18,200 lb.
Grate area	17.6 sq. ft.		

In November, 1931, The Baldwin Locomotive Works received an order from the Imperial Government of Persia covering four locomotives destined for service on the Southern Persian State Railway. These locomotives are of the Mogul (2-6-0) type and have a track gauge of 4 feet 8½ inches. As the engines were urgently needed a completion of ten weeks was specified and the four locomotives were completed, dismantled and boxed for shipment to Bandar Shahpour well within the time limit.

The characteristics of the line over which the locomotives will operate include minimum curves of 180 metres radius, grades of ½ per cent, rails weighing 70 pounds per yard and water stations located 50 miles apart. A total of 45 bridges are encountered on the line.

Persia is an oil producing country, therefore the locomotives are designed for burning this oil as fuel. The eight-wheeled tenders are each fitted with tanks holding 1,500 U.S. gallons of fuel oil and 4,000 U.S. gallons of water. The locomotives have piston valves, 8 inches in diameter, Walschaerts valve gear, pneumatic bell ringers and Westinghouse air brakes on all driving and tender wheels. Sunbeam turbo-generators supply electric current for headlights at front and rear and also for the cab lights. Automatic couplers are provided and have special lugs to accommodate a transition device as many of the present cars are fitted with European-type couplers. The principal dimensions of these locomotives are given in connection with the photograph reproduced above.

# The Fusenko Power Plant in Korea

Description of Largest Water Power Installation in Far East with Most Powerful Pelton Turbines in World

**G**THE biggest water power installation in the Far East is the Fusenko Power Plant situated on the Fusenko River (Korea).

The Fusenko River, which is a branch of the Yaolu River, has its source in the territory of the Fusenrei mountains, in the neighborhood of the Japanese Sea at an altitude of about 6,000 feet. After flowing approximately 100 miles in a northerly direction, it joins the Oryokko River. In its upper reaches, *i.e.* in the Kantairi Valley, the river is dammed so as to form a reservoir. This reservoir extends over an area of 9.3 square miles and has a storage capacity of approximately 25,000 million cubic feet. As a result of the storage of this quantity of water, a constant flow of 6,000 gallons per second is always available for power generation.

A pressure tunnel with a horse-shoe section, having a height of 13-ft. 4-in., a width of 12-ft. 4-in. and a length of 17 miles, leads the water to the surge chamber on the other side of the mountain range which rises from 4,920 feet to 5,900 feet. In order to prevent sand and mud from penetrating into the tunnel, the entrance of the latter was located at a height of 19 feet above the bottom of the reservoir and, furthermore, a rack is provided. From the surge chamber, a pressure pipe 10-ft. 4-in. in diameter, and made of plate  $\frac{1}{2}$ -in. thick, leads to the power station. There the pipe divides into four branches with diameters of 1-ft. 4-in. to 3-ft. 9-in. The pipes are riveted so as to overlap at the upper part, whilst at the lower parts they are provided with bandages.

Two Voith regulating valves are fitted in each pipe. The upper valve can be opened or closed either by hand or by an electric

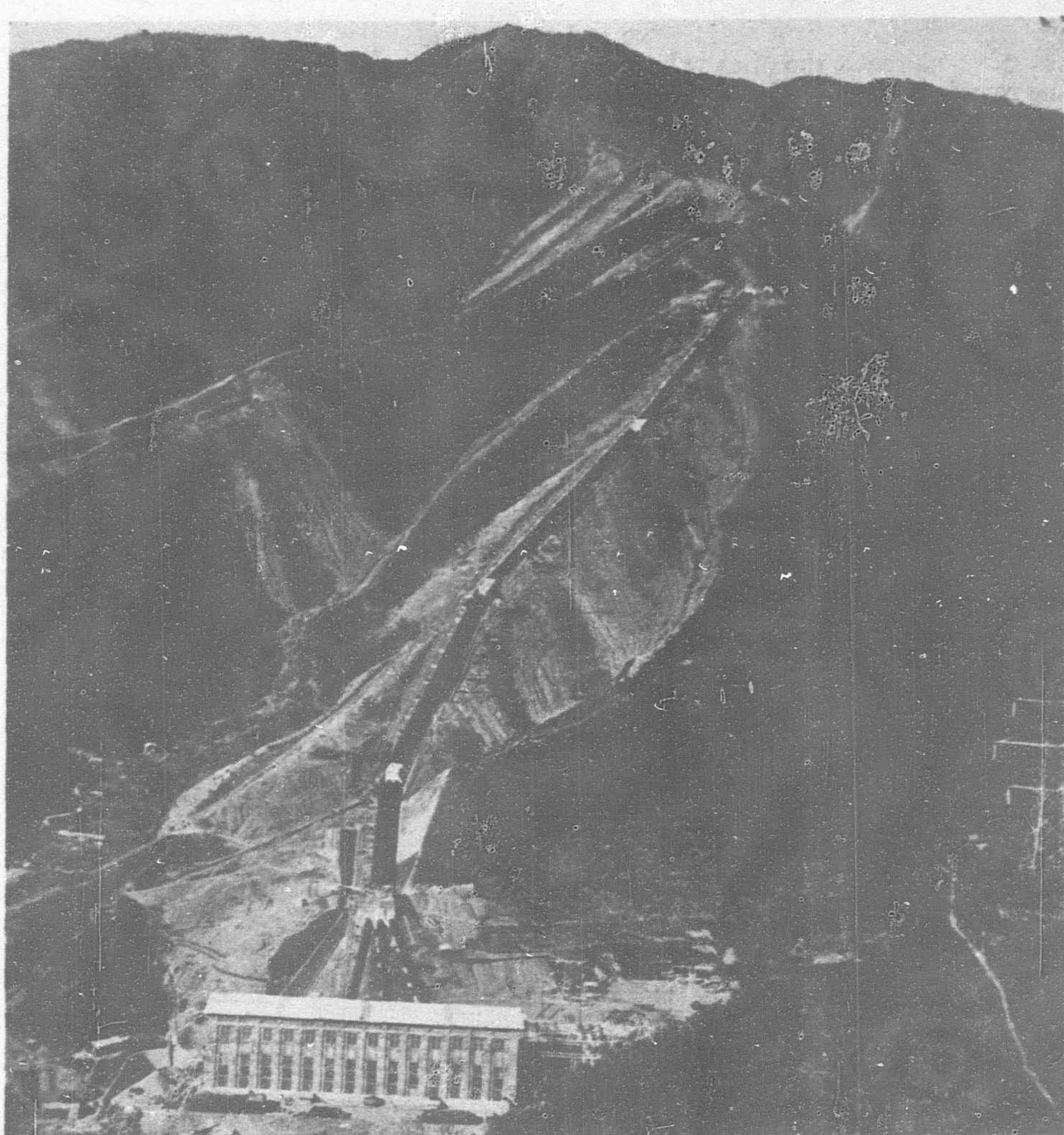


Fig. 1.—The Fusenko Power Plant

motor with spur gear and worm gear (Fig. 2), whereas the second valve is designed as a quick-acting valve. The construction of these quick-acting valves is particularly interesting and for this reason it is described below more in detail. A diagrammatic representation of the operating gear in Fig. 3 shows the relation between the various component parts.

The quick-acting valves are operated by drop weights. The valve spindle supports a roller lever (*a*), which is guided axially by a cross-piece (*b*). This cross-piece is connected to a servo-motor piston (*c*). A cup with the drop weights (*d*) which close the valve, is suspended to this piston. The servo-motor, the oil pressure of which is produced by a hand pump, brings the valve into the open position and as soon as the valve is fully opened it is mechanically locked (*e*). The operating gear is so designed that the valve can be closed by a release device in the event of the pipe bursting, through the intermediary of a lifting magnet with push button release, and also by hand.

If the speed of the water in the pipe exceeds a predetermined limit, the water pressure on a plate (*f*) becomes so great that the latter is driven out of its normal position of equilibrium. As a result the weight lever is released. A rod connected to it, releases the catch of a second lever which, up to then, prevented by means of a stop the fall of the weight and the closing of the valve. At the same time the pilot valve is freed from an additional weight through the intermediary of rods and opens through the action of the spring. The oil in the cylinder of the servo-motor is able to escape and permits the displacement of the piston of the servo-motor. When the drop action is nearly at an end, a guide arm

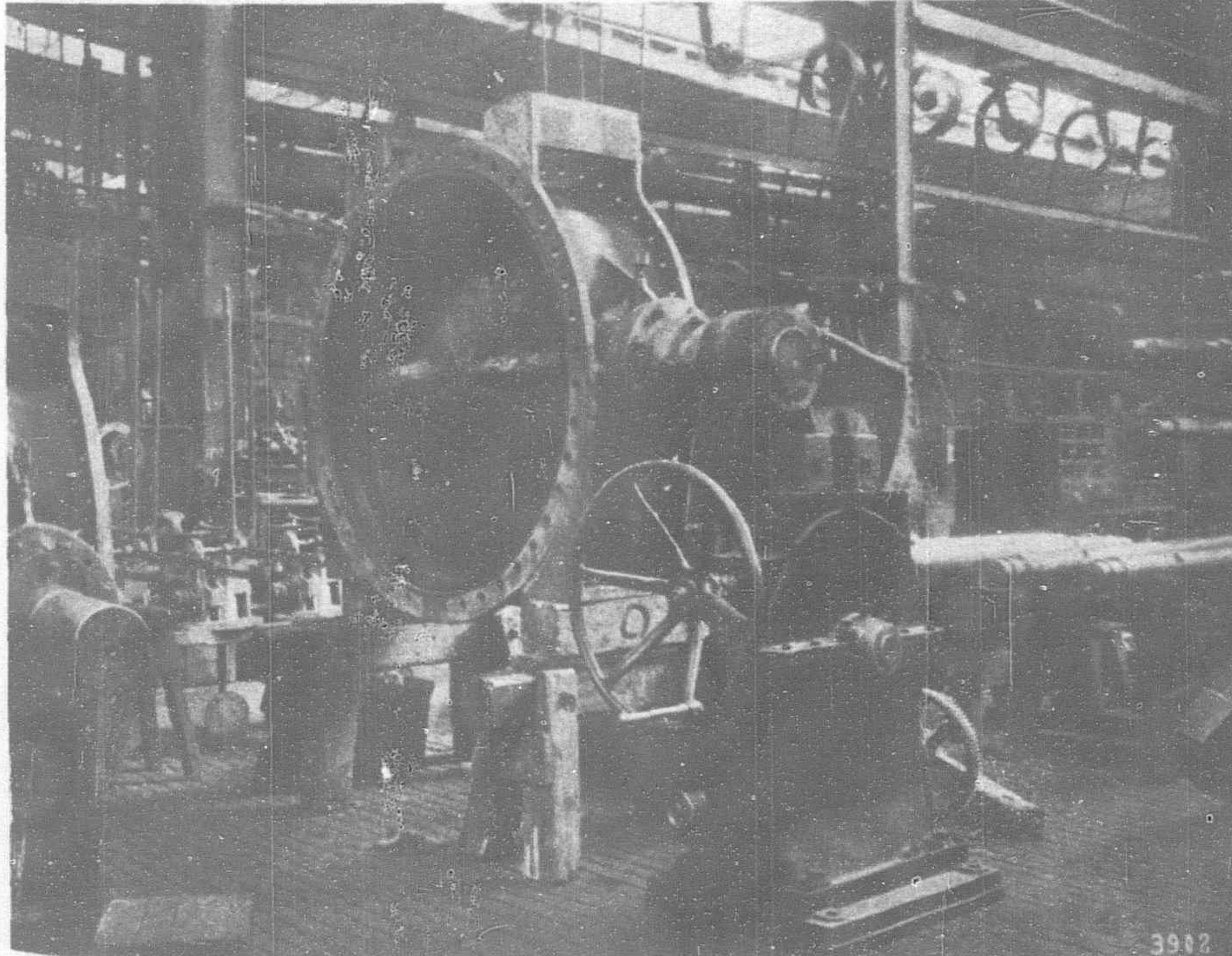


Fig. 2.—Voith Regulating Valves showing Upper Valve which can be Opened or Closed either by Hand or by Electric Motor with Spur Gear and Worm Gear

(h), which is fitted on the rod of the servo-motor piston, comes and rests against the end stop of the valve. As a result the pilot valve closes partly and the remainder of the oil in the servo-motor cylinder, which only flows out at a very slow speed, ensures that the valve comes gently to rest against its seat.

If it is desired to open the valve again, the operating gear is locked once more by means of a lever and the drop weight is raised by the servomotor with the hand pump. Pilot lamps on the switch-board in the power station show whether the valve is open or closed. The gear can also be released by a hand lever or by a lifting magnet (*k*). The mode of operation is otherwise the same.

Special supervisory gear makes it possible to ascertain quickly and easily, even during service, whether the valve is ready for operation, without disturbing considerably the flow of water.

A gas pipe is screwed into the end stop of the pilot valve (*g*), and runs through the guide arm of the servo-motor piston rod. A slot is milled in the upper part of the pipe and serves to take a key (*i*). If the valve is to be tested, this key is inserted into the groove of the pipe. If the drop-weight is then released, the guide arm, after a short drop, hits the key in the operating spindle and closes the pilot valve. Once the test is

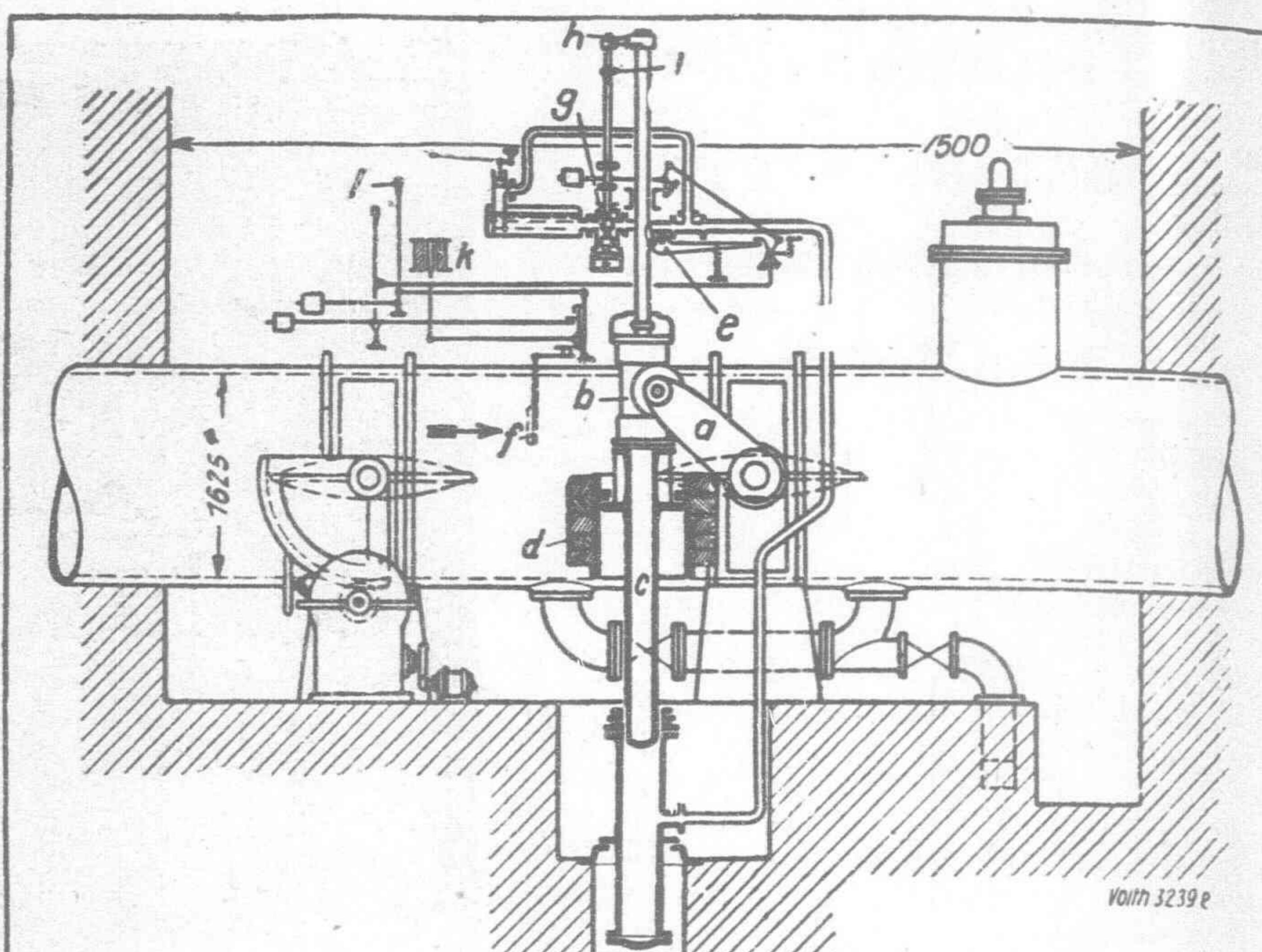


Fig. 3.—Diagrammic Representation of Operating Gear showing Relations between various component parts

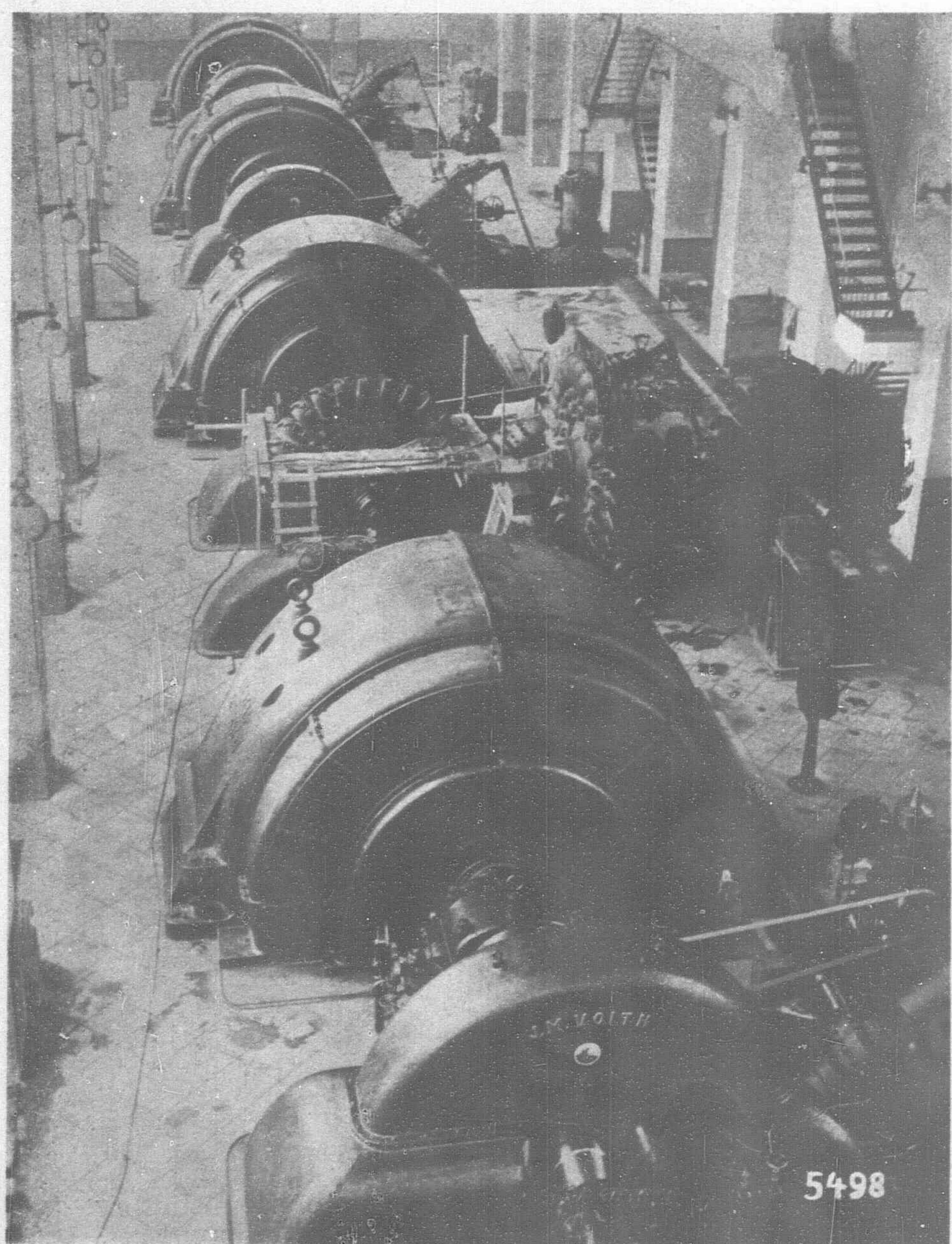


Fig. 4.—View of the Engine Room

completed, the key is removed and the drop weight is raised again.

In order to prevent a vacuum from forming when the pipes are emptied, or to permit the air to escape when the pipes are filled, combined air inlet and outlet valves are constructed under the valves in each pipe. When the pressure in the pipe drops to 39.4 in W.G. the valve opens and remains open until the water raises the float, *i.e.* until the pipe is sufficiently full again. The pressure of the water then keeps it closed.

In order to close the pressure pipe, a sluice valve, having an inner diameter of three feet and a length of 5-ft. 11-in. with hydraulic operating gear is fitted in front of each turbine.

The power station occupies a floor-space of 2,550 square yards. The four single wheel Pelton turbines with two nozzles, supplied by Messrs. J. M. Voith of Heidenheim a.d. Brenz (Wurttemberg, Germany) work under an effective head of 2,180 feet and develop 50,000 h.p. with 1,280 gallons of water per second and at 360 revolutions a minute. Fig. 4 is a view of the engine room.

During the official tests carried out by the Government prior to taking over the plant, a maximum efficiency of almost 92 per cent was obtained, and this result must be regarded as extremely satisfactory. We give in Fig. 5 the efficiency curve ; it will be seen from this curve that the values guaranteed were not only attained, but throughout exceeded.

Fig. 6 shows one of the turbines in the workshops of Messrs. J. M. Voith, Heidenheim, a.d. Brenz, and Fig. 7 is a sectional elevation of one of the turbines. The rotor of cast steel is fitted with 13 double buckets and has an external diameter of 11-ft. 4 $\frac{1}{4}$ -in. The buckets are fixed in relation to each other by keys and screwed on to the wheel. The total weight of a rotor is about 11.5 tons.

The shaft of the turbine has a maximum diameter of 21.6-in. The turbine and the generator are rigidly coupled together. On the opposite side to the generator, the shaft runs in a thrust bearing of 12.7-in. bore. The bearing has interchangeable white metal lined bushes, both top and bottom bush being water cooled. A revolving ring ensures automatic lubrication, while a

mercury thermometer permits of the checking of the temperature of the bearing. On the generator side, the turbine itself has no bearings, but there it is supported by the coupling of the generator shaft, which is itself carried by two bearings.

Shaft and rotor are enclosed in a cast iron casing with removable cover. A bedplate measuring 20-ft. 6-in. by 9-ft. 3-in. by 5-ft. 7-in. and weighing 12 tons supports the turbine.

The cast iron nozzle frame and the wrought iron shield of pit connect up with the bottom of the bedplate; they are bolted together and after being grouted in with concrete, form with the foundation, an extremely strong anchoring for the whole unit.

The nozzle frame carries the lower nozzle, including sand protection pipe, jet deflector and brake nozzle. The nozzles themselves are made of cast steel and have interchangeable end pieces. The diameter of the jet is seven inches.

Each turbine is equipped with a double governor of the Voith type, which both regulates the size of jet by means of the spear and acts upon the jet deflector. The mode of operation of such a double governor described below.

In the base of the governor there is a servomotor cylinder in which two pistons move; one of these acts on the spear and the other on the jet deflector. Each piston is operated by its own pilot valve. In case of a small alteration in load, the spear works alone, and as a result of its displacement in the nozzle ensures the necessary section of jet corresponding to the load. On the other hand, in the case of a sudden drop in load, the deflector also come into play. They deflect first part of the jet, or the whole jet, from the buckets. The spears move slowly forward, so that any dangerous increase in pressure in the pipe is effectively prevented, and at the same time the deflectors withdraw from the jet.

The double governor is equipped with a protective device

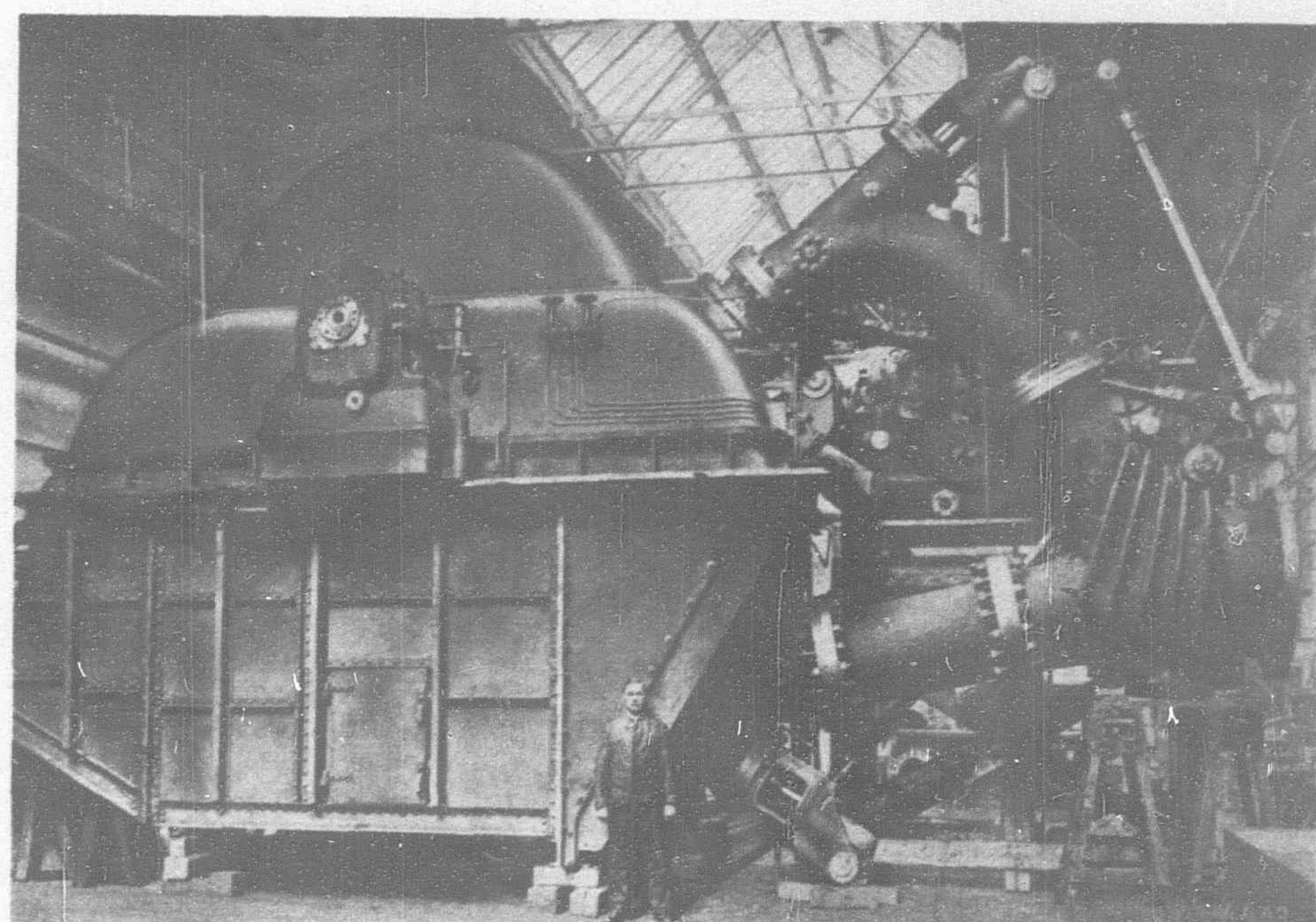


Fig. 6.—One of the Turbines in Workshops of Messrs. J. M. Voith, Heidenheim, a.d. Brenz

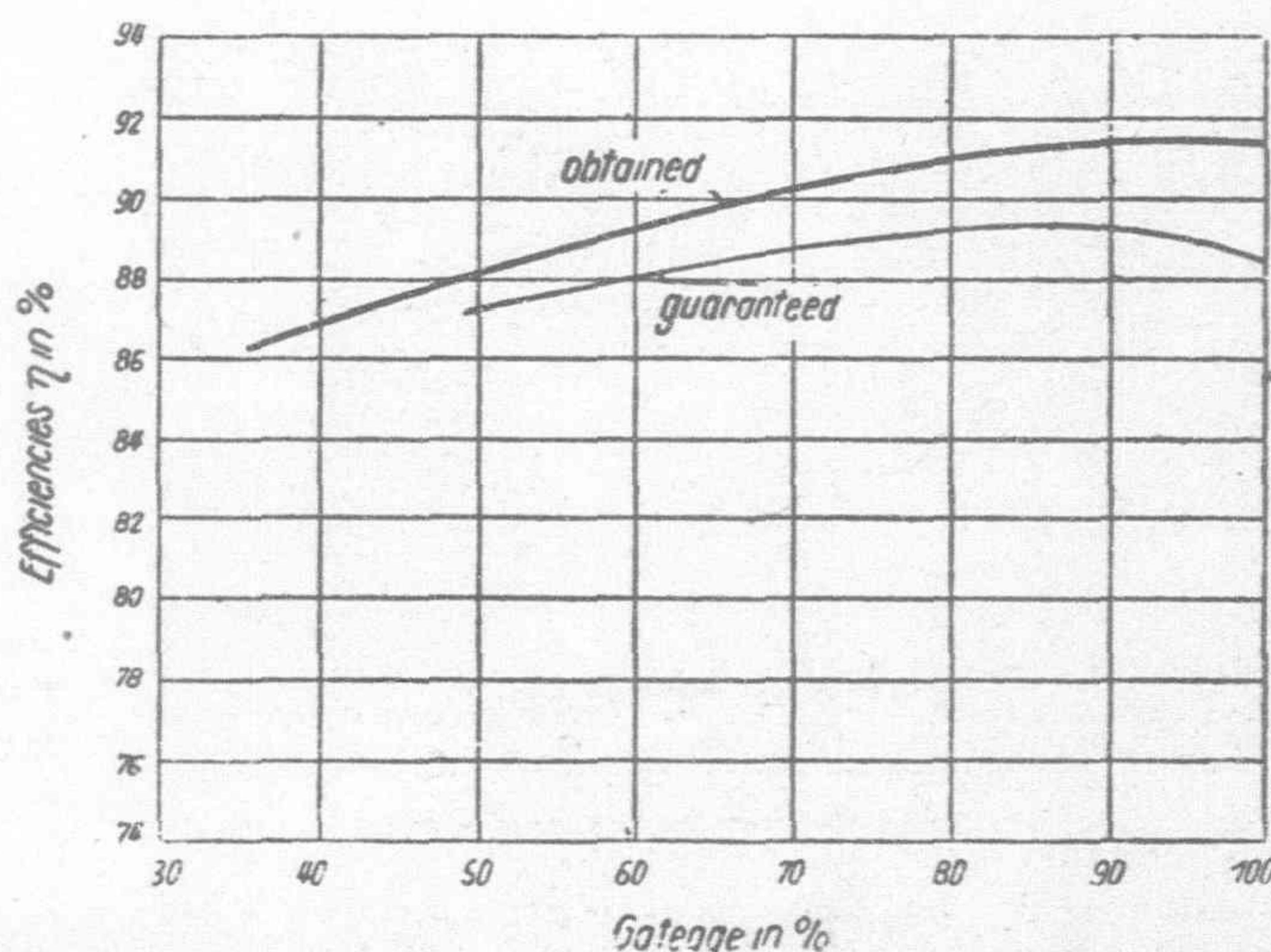


Fig. 5.—Efficiency Curve showing Values Guaranteed were Exceeded

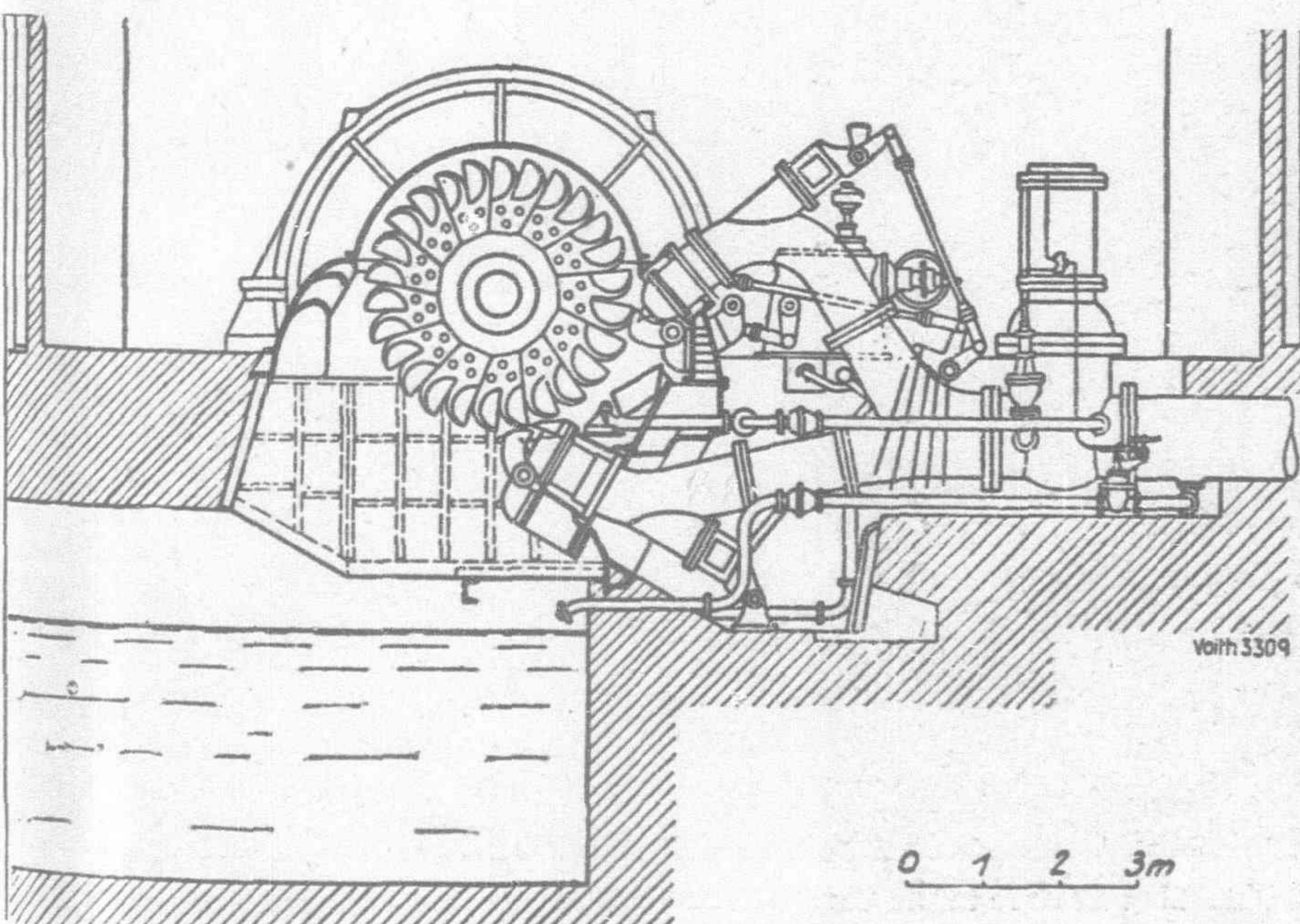


Fig. 7.—Sectional Elevation of one of the Turbines. The Rotor of Cast Steel is fitted with 13 Double Buckets and has External Diameter of 11-ft. 4 1/2-in.

in case of breakage of the belt. A roller fitted at the end of a lever runs on the belt of the governor. When the belt breaks, the roller drops. As a result, the lever releases a catch. A spring actuates the governor valve and the deflector is driven forwards.

On the other hand, in order to permit of the rapid closing down of the turbine, provision is made for a brake nozzle (counter nozzle). The mouth of this nozzle has an opening of 1.7-in. The water for the brake nozzle is obtained from a pipe connected in front of the main sluice valve, which is closed off by special valves. The size of the turbine may be gauged from the fact that the uppermost point of the casing is 8-ft. 11-in. above floor level, while the lower nozzle is situated 11-ft. 6-in. below the floor. The length of a turbine unit is nearly 39 feet. In view of their dimensions and their output of 50,000 h.p. per unit, the Fusenko turbines are amongst the most powerful Pelton turbines in the world.

### New Mechanical-Drive Turbine

A new mechanical-drive, non-condensing steam turbine for driving centrifugal pumps, fans, and other rotating equipment has been developed by the General Electric Company. This turbine is suitable for driving equipment at speeds from 1,200 to 4,000 r.p.m. and is available up to 250 h.p. under suitable steam conditions. The new turbine is a single-stage machine with two rows of revolving buckets. Simple in construction, it is an addition to the standard line of General Electric mechanical-drive turbines. The wheel casing is split horizontally to allow easy access to the internal parts and the steam and exhaust pipes are connected to the lower half of the machine. A centrifugal governor, with weights pivoting on knife edges, operates with very little friction and provides proper speed regulation.

## Unusual Lighting for a Carnival Tower in Manila\*

LIGHT through translucent material, as a feature of decorative lighting, is much in vogue in France and other European countries, and its application in a large way was introduced last February in Manila, for a temporary structure at the annual carnival of that city.

The local lighting company, popularly known as "Meralco" erected a dominating structure in the way of a square tower of unique design, rising to a height of 120 feet with a base 42 feet square. In structure, the tower was a shell of wood, supported by steel framework and covered with cloth, but having, withal, the appearance of substantial masonry.

In planning for its decorative illumination, it was decided that the four pilasters that follow the corners upwards for some 40 feet, and the corner obelisks above, as well as the pyramidal top and certain panel sections, should glow with light from within. To accomplish this, it was out of the question to employ glass as a covering of such extensive surfaces, and it was decided to use a tough but translucent grade of oiled paper through which light would be diffused from lamps inside.

This was accomplished with most successful results, and the tower, a skyscraper of interesting architecture by day, was a picture of particular beauty at night. Red lights shone through the sides of the pyramid at the top of the tower, making a pleasant contrast with the columns of white light.

The name of the company painted on translucent panels stood out plainly at all times in silhouette above archways that gave entrance to their display of electrical

merchandise such as is rapidly gaining popularity in the households of the world.

Over 2,400 lamps, representing a load in excess of 100 kilowatts, were used in the illumination. Introduced for the first time on such a scale in Manila, and a bold departure from former methods, this application of "light moderne" was generally acclaimed the finest example of decorative outdoor lighting ever seen in this progressive city.

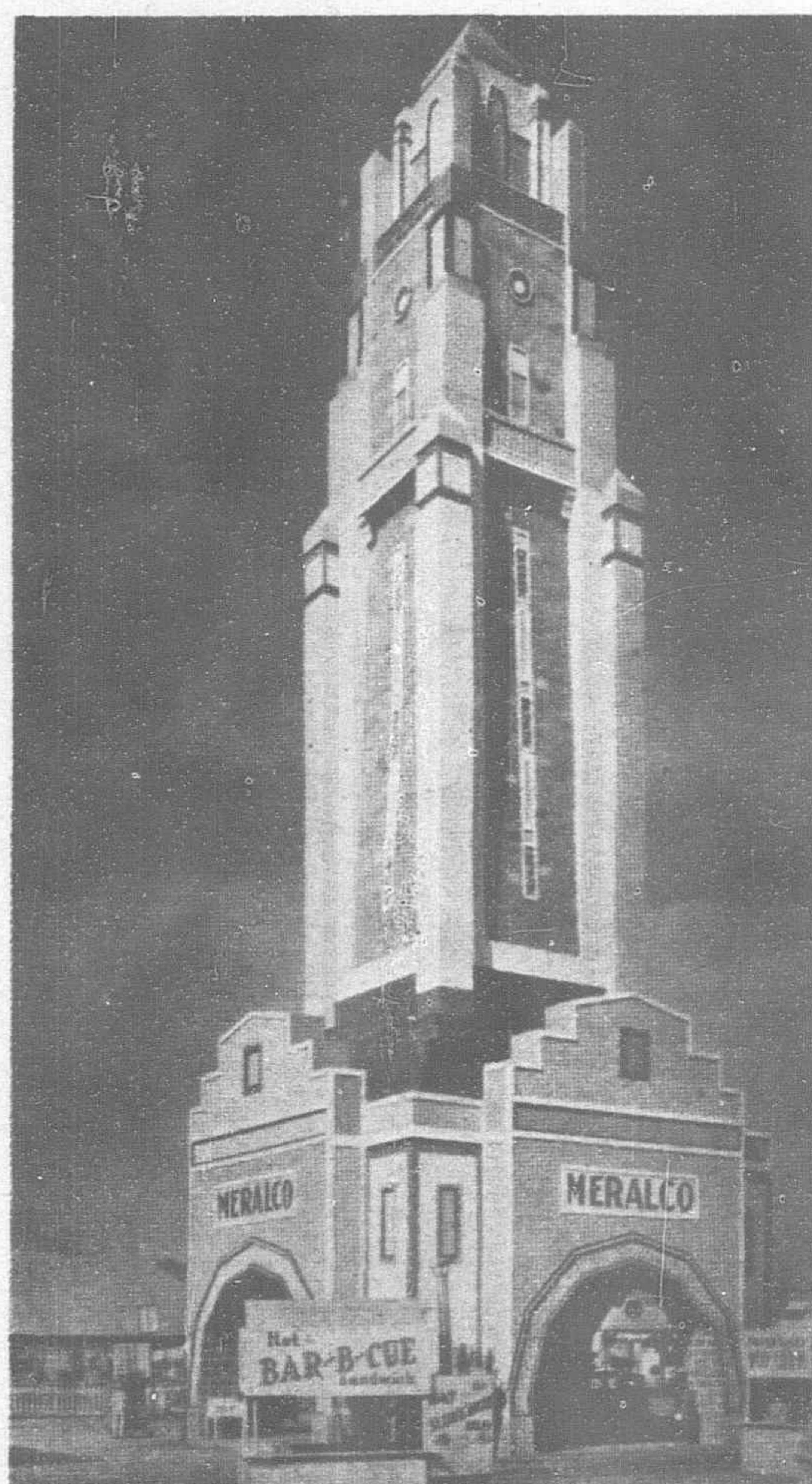
\*The Digest.

### Gold Mines In China

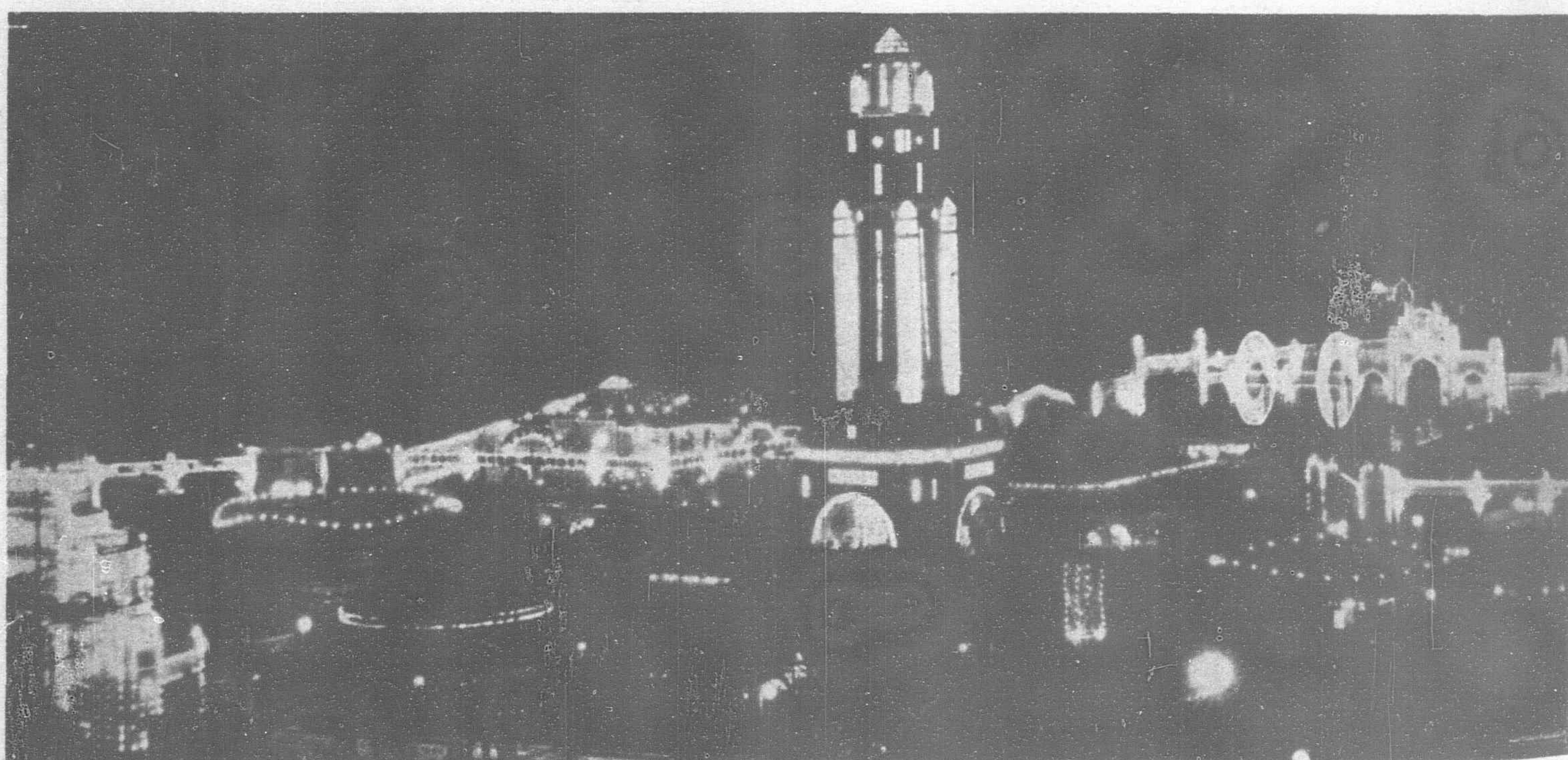
Operation of the gold mines at Hsinglung, north-eastern Hopei, will be resumed shortly and for this purpose the Provincial Department of Industry for Hopei has been instructed to appropriate a sum of \$75,000, according to General Yu Hsueh-chung, Chairman of the Hopei Provincial Government.

The mines, which have heretofore been operated as a joint private and Government enterprise, are rich both in gold and copper, yielding a monthly output of between 3,000 and 4,000 taels (ounces) of gold and about 9,000 taels of copper. Owing to dissatisfaction on the part of individual shareholders, who contended that they should have the majority of the shares, a dispute arose recently, resulting in the suspension of work.

The Provincial Authorities are now adopting a conciliatory attitude, General Yu said, and are conceding two-thirds of the profits in the mines to the private shareholders.—Kuo Min.



The Meralco Tower 120 Feet in Height, at the Manila Carnival of 1932



The Tower was an Outstanding Feature in the Carnival Illumination

# Craven Brothers Supply Double 50-inch Center Lathe for Russia\*

**A**LARGE double lathe of unusual design, shown in the accompanying illustrations, has been built by Messrs. Craven Brothers (Manchester), Ltd., of Reddish, near Stockport, and forms part of a large order for machine tools from the Russian Government for use at Donetsk, near Kharkov, in the Ukraine.

The machine has 50-in. centers and comprises two single lathes on one bed, the face plates of both driving headstocks facing inwards, and the loose headstocks being placed midway on the bed, back to back. This arrangement permits of the operator's position being normal for either lathe. For convenience of description the left-hand end of the machine in the illustrations is referred to as the main, and the right-hand end as the secondary lathe. The left-hand driving headstock only is used when operating the machine as a single long lathe, one loose headstock being removed and the other run up to the right-hand end of the bed. Six saddles are provided, three at the front and three at the rear, arranged as follows:—In the main lathe the two front saddles have swivel rests and one rear saddle a non-swivelling rest; in the secondary lathe, of the two front saddles, one has a swivelling and one a non-swivelling rest and one rear saddle has a swivelling rest.

When the machine is used as one long, single lathe capable of admitting 32-ft. 6-in. between the centers, the six saddles may, of course, be used as desired, the rear saddle on the secondary lathe becoming a front saddle by removing a packing piece, and, similarly, the front saddles of the secondary lathe becoming rear saddles by the addition of packing pieces. The necessary placing of the various components for use as either one or two lathes is easily carried out.

The bed is of the four-shear pattern, composed of four sections accurately jointed and having overall dimensions of 112-ft. in length and 9-ft. 9-in. in width. The driving headstocks are of the totally enclosed type, having a spindle speed range from 0.625 to 19.3 revolutions per minute. The spindles are 18-in. diameter at the front neck and are of forged steel, running in parallel capped bearings and fitted with multi-collar thrust bearings. The gearing throughout is of steel, the final drive being by spur pinion supported on both sides and meshing with a gear ring of large diameter on the face plate. Levers are conveniently arranged on the front of each headstock for making the various changes of gear.

The face plates are 8-ft. diameter and are carried on a spigot and flange forged solid with the spindles. They are fitted with

four massive heat-treated steel jaws carried in steel slides and operated by screws and a ratchet lever. Mechanical lubrication is provided to all the bearings in the headstocks, and to prevent the ingress of dirt a filter is introduced into the oil circuit. In addition, a cascade oiling system gives a continuous flow of lubricant to all the gear teeth.

The main drive is by means of variable D.C. motors of 250-750 revolutions per minute, the motor which drives the main headstock giving 75-200 horse-power, and that which drives the secondary headstock 75-120 horse-power. These motors are mounted on base plates on the end of the bed as shown in the illustrations, and drive the spindles through Bibby flexible couplings and four sets of gearing. In each of the headstocks a tachometer and ammeter are

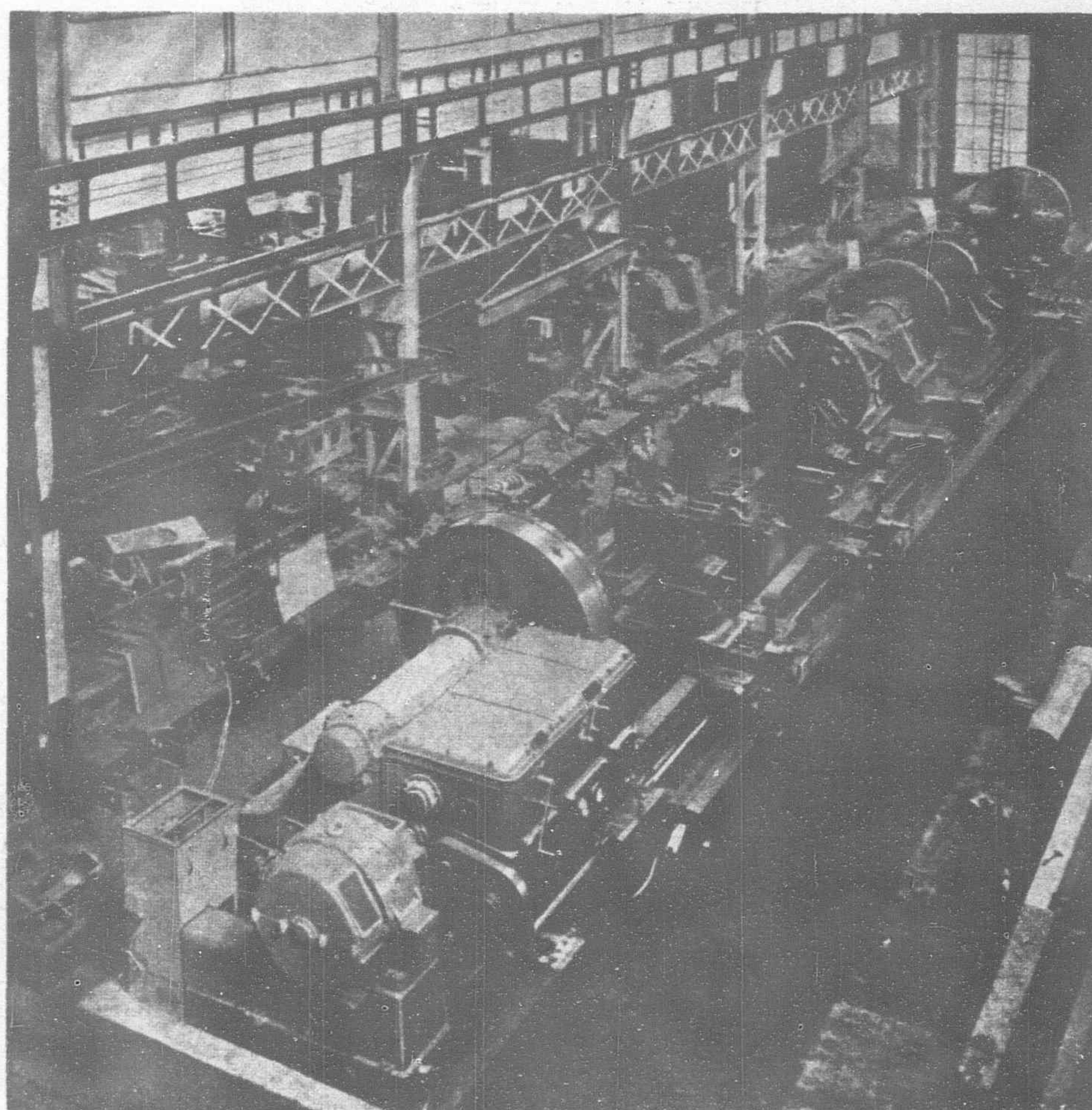
fitted, and electrically lit inspection windows are provided to view the oiling and gearing. A push-button station is fitted to the headstocks with "stop," "start," "inch," "accelerate" and "retard" positions indicated.

Each saddle has a self-acting surfacing motion through a screw and nut, a self-acting sliding motion by rack and pinion, and hand and quick-power traverse along the bed, the last-named being operated by means of separate and independent flange mounted motors. All gearing for obtaining the six sliding and six surfacing feeds is within the apron.

The saddles fitted with swivelling slides have a longitudinal power feed to the top rest, enabling short tapers to be dealt with when desired. Push-button control stations are arranged on each saddle. These control both the main motors and the quick-power traverse motors, switches being fitted to

the secondary lathe control stations to enable them to be used for operating the main or secondary headstocks according to whether the lathe is used in its single or double capacity. Each of the saddles has a one-shot oil pump, which draws its supply of lubricant from a tank in the apron for the bearings.

The feed shafts which actuate the sliding and surfacing feeds to the saddles are arranged on each side of the lathe. It will be realized that both front and rear feed shafts must be capable of being used either as one long shaft driven from the main headstock when using the lathe as a single machine, or as two independent shafts driven from the main and secondary headstocks respectively when acting as a double lathe. This has been arranged as follows:—Each headstock drives its front feed shaft through a



Showing Lathe Set Up in Shop



Another View of the Big Lathe

gear-box, a cross shaft being run out of this gear-box through the bed to drive the rear feed shaft. The front feed shaft may be engaged or disengaged at the gear-box at the same time disengaging the rear feed shaft drive, which may also be disengaged independently if desired. The ends of the four feed shafts are held in auxiliary bearings at the center of the bed, and each length of shaft is supported by three self-acting tumbler bearings.

In order to use the machine as one long single lathe, the feed drive is disengaged at the secondary headstock end, and the front and rear secondary feed shafts are moved along and jointed to the main shafts in the customary way, the auxiliary bearings afterwards being drawn back to allow the saddles to pass over the joint. The feed shafts are then driven by the main headstock in the manner previously described.

The loose headstocks may be set over on their intermediate plates for alignment purposes, and are arranged with a steel revolving spindle moving in parallel bearings with multiple-collar thrusts. Each headstock has a 7-ft. face plate having four steel jaws. The spindles are provided with inner sliding barrels, adjustable endwise by means of a screw and suitable gearing, which is hand-actuated. Hand and quick-power traverse along the bed is provided, the latter being by separate flange-mounted motors. All the rotating parts are enclosed and mechanical lubrication is provided to all bearings.

The machine is provided with two four-point stationary stays and two roller stays, the latter being arranged with two intermediate plates for height setting.

The principal dimensions are as follows:—

Height of centers	..	..	..	50-in.
Length of bed	..	..	..	112-ft.
Will admit between centers (when used as a double machine)	..	..	..	32-ft. 6-in.
Ditto, when used as a single machine	..	..	..	75-ft.
Will swing over saddles	..	..	..	80-in.
Width of bed	..	..	..	9-ft. 9-in.
Diameter of spindle neck, front	..	..	..	18-in.
Diameter of faceplate	..	..	..	8-ft.
Range of spindle speeds, r.p.m.	..	..	..	0.625 to 19.3
Six sliding feeds	..	..	..	—
Six surfacing feeds	..	..	..	—
Approximate net weight of lathe, less electrical equipment	..	..	..	260 tons

The following are the particulars of tests made on the secondary lathe:—On 40 ton steel shaft, 23½-in. diameter by 22-ft. 2-in. long, one end gripped in the chuck and the other end held in the chuck jaws of the loose headstock, the bar being supported in the center by a four-point stay; cut, 1 ¾-in., divided between four tools, each tool taking a cut of  $\frac{1}{64}$ -in.; feed to each tool (front) being  $\frac{1}{16}$ -in., and to each tool (back) being  $\frac{1}{32}$ -in.; cutting speed, 7 r.p.m. (42-ft. 6-in. per minute) giving 151 cubic inches of metal removed per minute.

A high-speed test was also taken as follows:—Cut,  $\frac{1}{4}$ -in., divided between two front tools, each tool taking  $\frac{1}{8}$ -in., the feed to each tool being  $\frac{1}{16}$ -in., and the cutting speed 14 r.p.m. (85-ft. per minute), giving 85 cubic inches of metal removed per minute.

## Aviation in Russia

A new organization for transport aviation (Transaviatsia) has been formed within the Soviet civil aviation system. Its major function is to be the organization throughout the U.S.S.R. of uninterrupted mail and passenger service and to improve transport aviation facilities through an increase in the number of planes, the building and improvement of landing fields and radio facilities. At present up-to-date equipment is being installed on the model lines Moscow-Tiflis, Moscow-Mineralnye Vody and Moscow-Vladivostok.

Almost all of the airplanes to be used for transportation purposes are of Soviet design and manufacture. In addition to the tri-motor ANT-9 and the other types now in use, it is expected to put into operation a number of giant planes of the ANT-14 type accommodating 36 passengers and five members of the crew. All-steel planes of stainless steel ("Stal-2" type) are also to be built.

The Moscow-Magnitogorsk and the Moscow-Stalingrad airlines are to be opened by the middle of this summer. The work

connected with the improvement and installation of new equipment at the Leningrad airdrome was completed at the end of June. This airport is the principal part of a large "aviation city" of the civil aviation fleet. It is equipped with the most up-to-date apparatus and has facilities for the simultaneous takeoff and landing of several planes. An air depot is soon to be constructed with quarters for aviators and passengers.

Extensive work is now being carried on in connection with the development of new airlines in the Far East. On June 15 the second section of the Trans-Siberian airline connecting Irkutsk with Vladivostok was opened, so that now the large cities of the Soviet Union will be connected by air routes with the major points in the Far East. The planes to be used between Moscow and Vladivostok are of the ANT-9 tri-motor type. The Khabarovsk-Petropavlovsk airline is also now under construction and will connect the coast of the Okhotsk Sea and Kamchatka with the central part of the Far Eastern Region.

# Marconi Beam Services to be Employed in New China Wireless Stations\*

**N**EW Marconi transmitting and receiving stations are to be erected near Shanghai for the operation of the proposed short-wave Beam services between China and Europe and the United States of America.

The equipment of the new stations will include two Beam transmitters and four sets of receiving apparatus, all of which are to be manufactured at the Marconi Works, Chelmsford, Essex, to the order of the Chinese Government.

A unique feature of the installation will be the inclusion of auxiliary Marconi apparatus, enabling the transmitters to be utilized for broadcasting services when they are not in use for telegraphic communications.

While the two Beam transmitters will follow standard practice in the principal features of their design, arrangements have been made for them to operate on increased power, and the consistently reliable service given by the present Marconi Beam stations in all parts of the world indicates that this provision of additional power will give the Shanghai station a wide safety margin for good communication under all conditions.

The auxiliary apparatus for broadcasting consists of a modulating equipment which can be connected to either of the telegraph transmitters, when not in use for normal service, to provide telephone signals of broadcasting quality. A complete set of Marconi studio equipment is also to be supplied to enable this auxiliary service to be conducted in accordance with the most modern practice, and as the program will be transmitted on short-wave lengths, probably below 50 meters, it is likely that British listeners with suitable receivers will be able to pick up the Shanghai programs.

The aerial system of the transmitting station is of particular interest. For the commercial telegraph services to Europe, of which the principal is the service to Great Britain, two bays of Beam aerials, accurately oriented to concentrate their signals on the



The biggest Marconi Beam Station in the World; the transmitter hall of the Dorchester Beam Station, which operates high speed telegraph services to North and South America, Egypt, Siam, Japan, etc. The working of the station is directly controlled from Electra House, London, the main telegraph office of Imperial and International Communications, Limited.

receiving stations, are to be erected, one being tuned to the wave length of 17 meters and the other to 26 meters, the wave lengths allotted to these circuits. A third Beam aerial array will be directed on San Francisco for the American service.

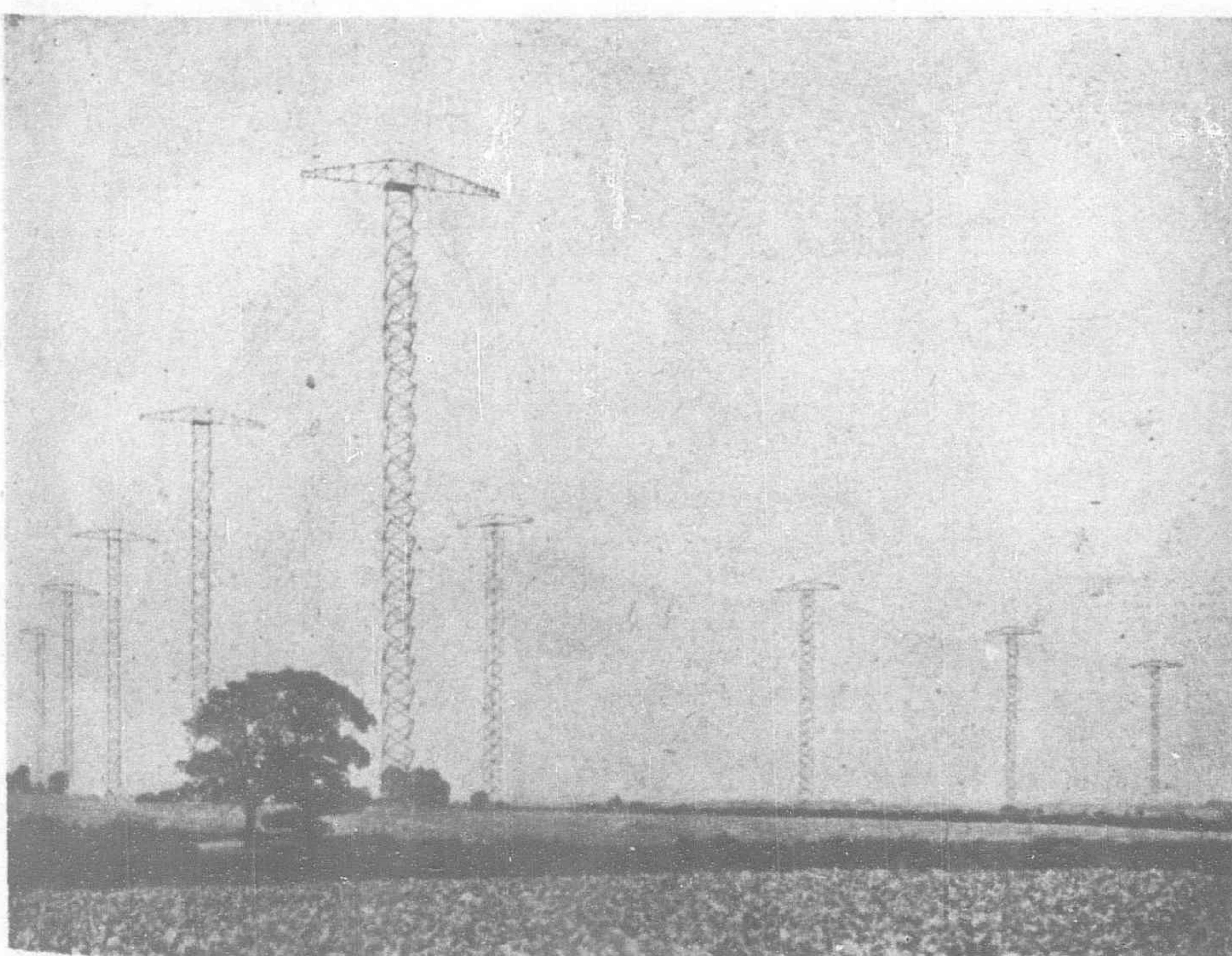
In addition, there will be four omni-direction aerials, one of which will be used for broadcasting. The others are provided to afford the station the maximum flexibility in the range and extent of its telegraphic services, enabling the equipment to be used if required for short-wave communications over comparatively small distances, for which the special qualities of Beam transmission are not necessary.

At the receiving station four high-speed commercial service receivers of the Marconi Beam type are to be installed, with two

Beam aerial systems directed on Europe and two on San Francisco, for the reception of the European and American services respectively. Four omni-directional receiving aerials are also to be supplied for the reception of short-wave signals from other countries with which Beam services are not required.

On the completion of these Beam transmitting and receiving stations near Shanghai, a direct commercial wireless circuit will be provided for the first time between Great Britain and China, constituting a valuable complement to the present channels of communication between this country and the Far East.

Since its inception in 1926 on the "Empiradio" service between Great Britain and Canada, the Marconi short-wave Beam system has revolutionized the technique of long-distance wireless communications. The speed and reliability of the system on the Canadian service and the other "Empiradio" services opened later in 1926 and in 1927 with Australia, India and South Africa, and between Canada and Australia, far exceeded the guarantees imposed and accepted, and established the claim of the Marconi Beam to be the most successful method of regular wireless communication over great distances. *(Continued on page 485)*



A typical array of Marconi Beam masts, with aerials and reflectors

# Air-Transportation of Gold Dredges in New Guinea

BY CHARLES A. BANKS

(The following article is an abstract of a paper read before the Institution of Mining and Metallurgy as published in *The Engineer*.)

THE development, in 1929 of a large volume of dredgeable gold-bearing gravel, in the Mandated Territory of New Guinea, brought the directors of Placer Development, Ltd., the exploration company which had proved the area and wished to equip it, face to face with an unusually difficult transportation problem.

The dredging property consisted of a stretch of  $4\frac{1}{2}$  miles of the Bulolo River-bed and flats, situated approximately 7 deg. south of the Equator, at an elevation of 2,250-ft. above sea-level, and 35 miles, in a direct line, from the coast. The proved ground averaged about 2,000-ft. in width, while the average depth of the gravel was 22-ft. The Bulolo River, which runs throughout the length of the property, is about 200-ft. wide, and carries from 250 cubic feet to 300 cubic feet of water per second in the dry spells, and up to perhaps twice that amount at other times.

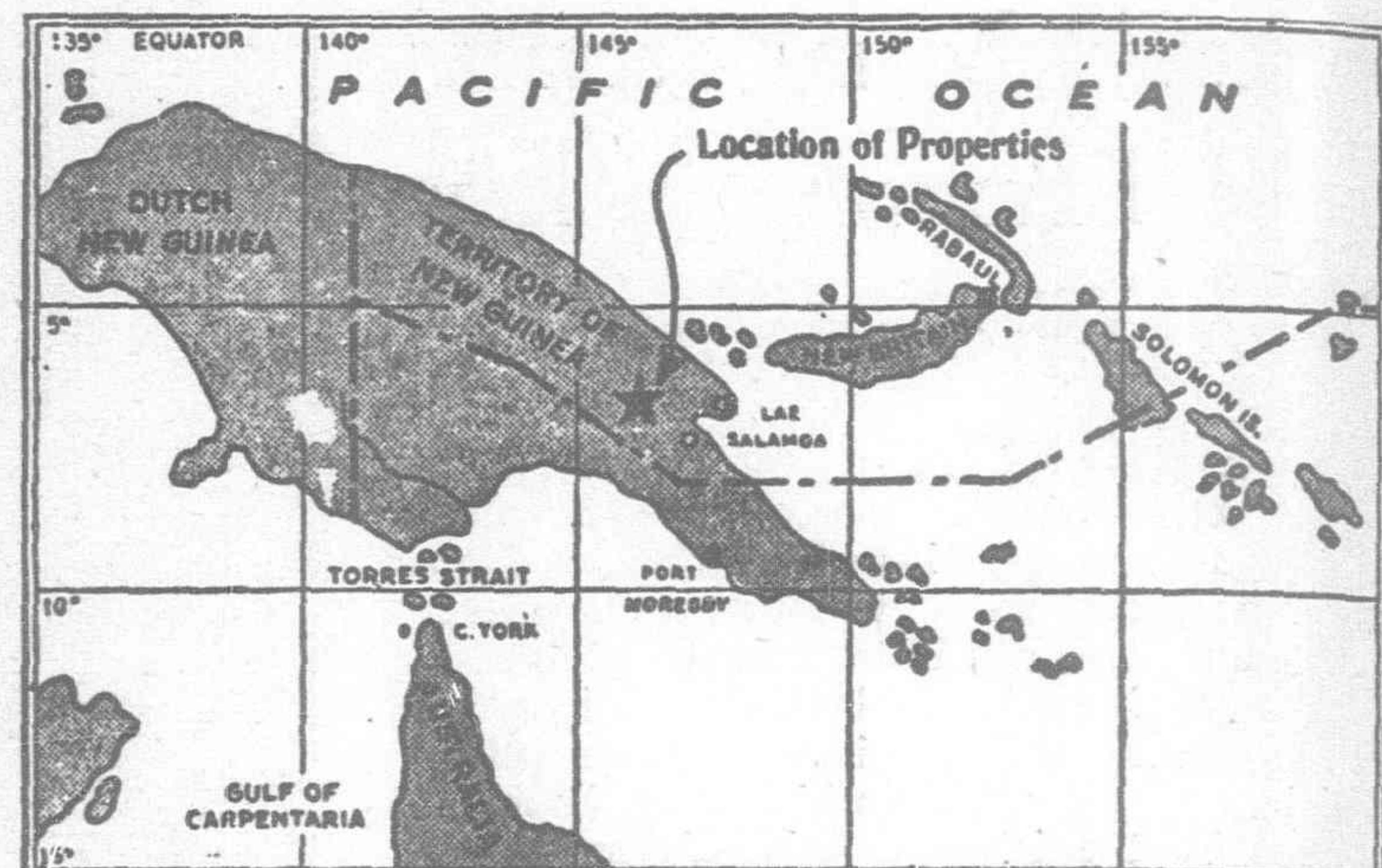
The dredging ground was covered with heavy tropical jungle, and fortunately there existed a number of magnificent cedar trees, which later supplied excellent construction lumber.

The valuation of the property, based on drilling and shafting, set the volume of dredgeable ground at 40,000,000 cubic yards and the average recoverable gold content at 50 c. per cubic yard. The gold, which is approximately 650 fine, is contained throughout the depth of the gravel with a concentration of values towards the bottom. These gold-bearing gravels are the erosion product of a gold quartz-vein area situated about 12 miles further upstream, and at several thousand feet higher elevation.

The gravel was found to contain a number of fairly large boulders, particularly in the upper portion of the deposit, though nothing was encountered in the shafting which a dredge of 10 cubic feet bucket capacity would be unable to handle. In spite of the presence of these boulders the gravel was considered as being particularly easy digging ground, and, further, remarkably free from clay. The "bedrock" consisted of soft blue clay, giving a very satisfactory dredging bottom.

For the purpose of equipping the property with two all-steel bucket dredges, each of 10 cubic feet bucket capacity, and of harnessing the Bulolo River, at the upper end of the property, for supplying several thousands of electrical horse-power for driving these dredges, Placer Development, Ltd., formed, in the early part of 1930, an operating company named Bulolo Gold Dredging, Ltd.

Recently Bulolo Gold Dredging, Ltd., absorbed an additional volume of approximately 60,000,000 yards of gravel of an estimated gold content of roughly 30 c. per yard, situated on the Bulolo and Watut rivers, immediately downstream from the original Bulolo area. As no road whatever existed from the coast to the property, the all-important question of transportation had now to be settled—on this hinged the success of the whole undertaking. The construction of a road was carefully considered and trial surveys were made. It was found, however, that to cross an intervening range of mountains, the lowest pass through which



Situation of the Bulolo Dredging Ground

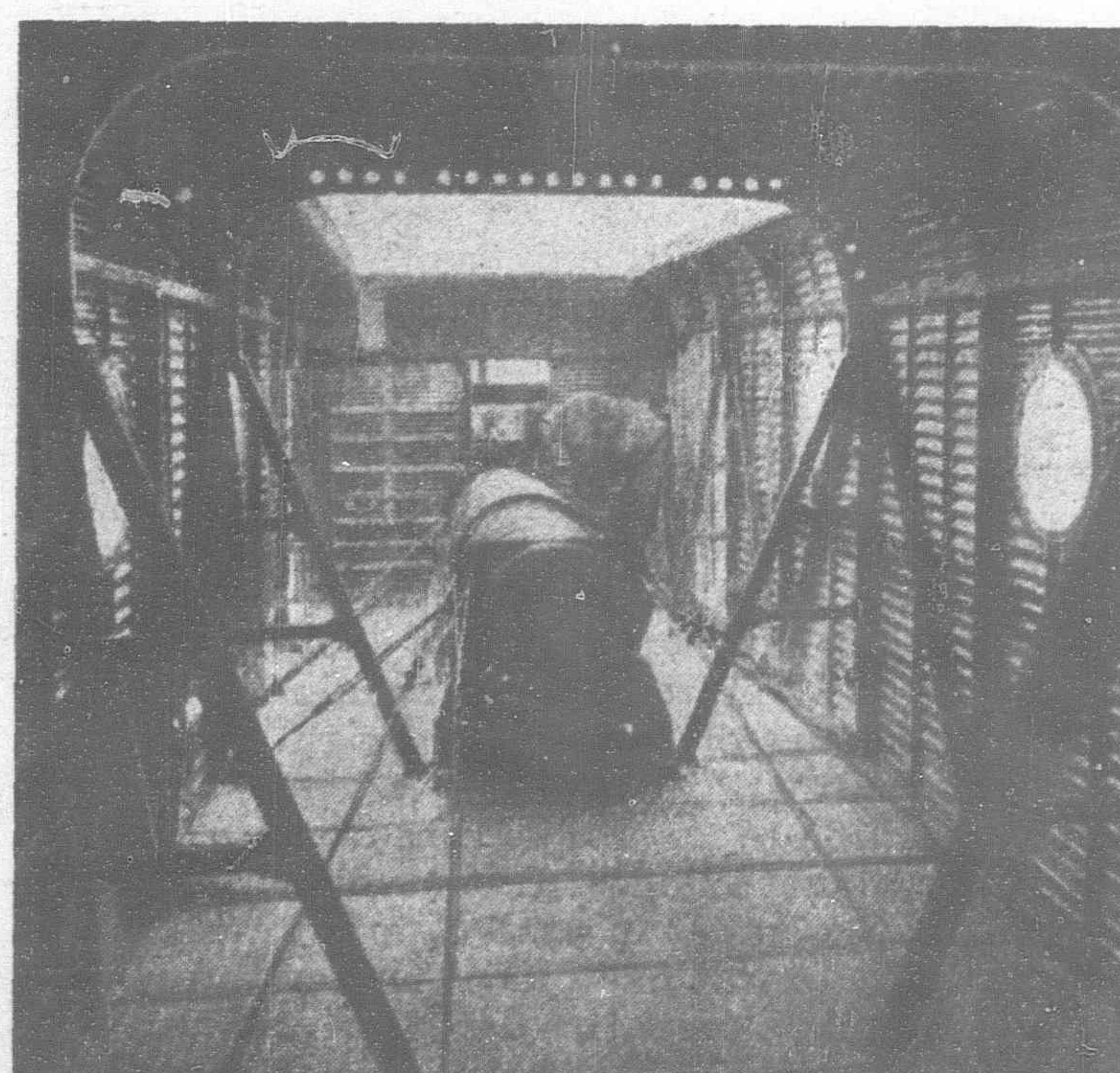
was roughly 4,000-ft., the road would have been over 90 miles in length, would have taken from a year to a year and a-half to build, and cost approximately a million dollars. Further, the building of a road, and the acquisition of suitable hauling equipment, would not necessarily have overcome the transportation question, for road maintenance in a tropical country such as New Guinea, with its sudden heavy rainfalls, and its abundant tropical growth, was quite an unknown quantity.

Was there any alternative? Time was an important factor, as it always is where large potential profits are waiting to be won.

During the testing of the ground, communication with the coast had been maintained by a local air transportation company—Guinea Airways, Ltd.—and the whole of the equipment and the general supplies for the testing had been safely taken to the field by this company's aeroplanes, which carried up to 2,000-lb. per trip.

Was it possible to air-transport large steel dredges, and a hydro-electric plant of several thousand horse-power? Air transport on such a scale had never been attempted. Could the weights and dimensions of the equipment be sectionalized to aeroplane requirements? If so, would the cost of such sectionalizing and the extra cost of field erection be excessive, and, if not, was the capital cost of suitable aeroplanes, and the cost of operating them, to count it out? And further, if not, was the risk too great? The loss of a critical piece might set everything back months, and it was even conceivable that a run of bad luck might kill the whole enterprise.

All these were questions requiring the most careful consideration. The writer conferred with Mr. Frank Griffin, of San Francisco, a co-director who was to be responsible for the design of the dredges, and obtained details of the critical parts, both as to weight and size, that would require to be air-transported to the field. The Junker Aeroplane Manufacturing Company considered that it could adapt its standard tri-motored G-31 passenger plane to provide a suitable sized cargo cabin or compartment, and, for the short distance over which we wished to transport the machinery, to make it capable of carrying up to 7,000-lb. of freight. It also decided that a large hatch could be provided in the roof of the cargo cabin, so as to allow of the aeroplane being loaded by crane. A model of the cargo



Tumbler Shaft Loaded for Transport

compartment was then made and models of all the critical parts which had to be carried were loaded into the model cargo compartment, particular care being taken to see that such pieces as approximated the capacity of the plane, such as the upper tumbler shaft, which weighed 7,000-lb., were capable of being loaded over the center of gravity of the machine, which was situated almost directly under the hatchway and about 6-ft. from the front of the cargo compartment. With a few alterations in the then contemplated design of the critical parts and some further slight alterations to the cargo compartment, it was apparent that the aeroplane could be made to suit the requirements.

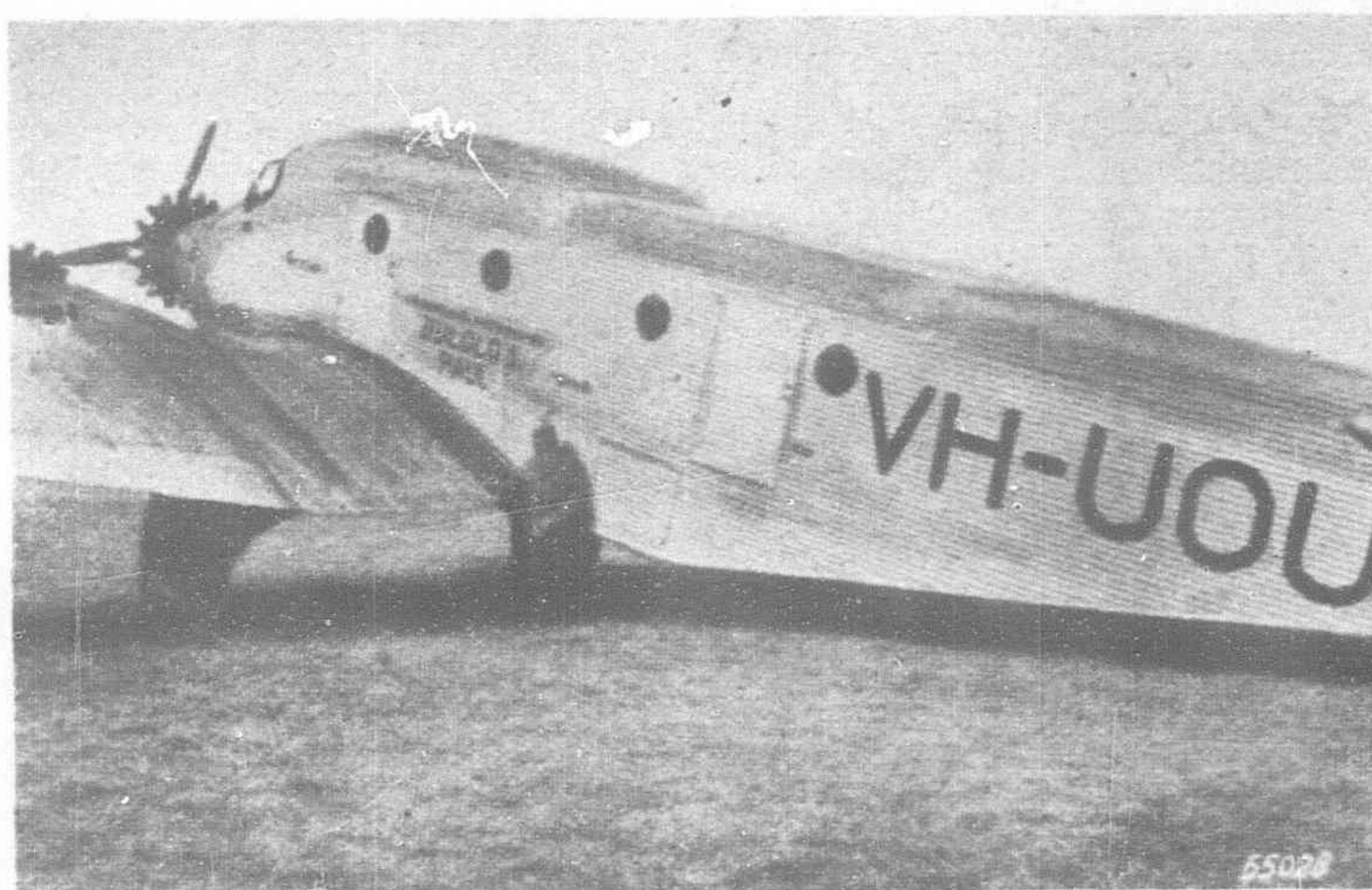
Further, it was soon realized that the cost of sectionalizing, and the extra cost of erection in the field, would not be excessive, and still further, that, with proper precautions, the risk of losing parts was really very slight.

In December, 1929, it was decided to abandon all idea of a road, and to air-transport the whole of the machinery and equipment from the coast to the site of erection in the field. The total weight of machinery and equipment to be carried for the two dredges and the hydro-electric plant was estimated at 2,400 short tons, and, in order not to delay construction, it was figured that 200 tons monthly would be required to be carried.

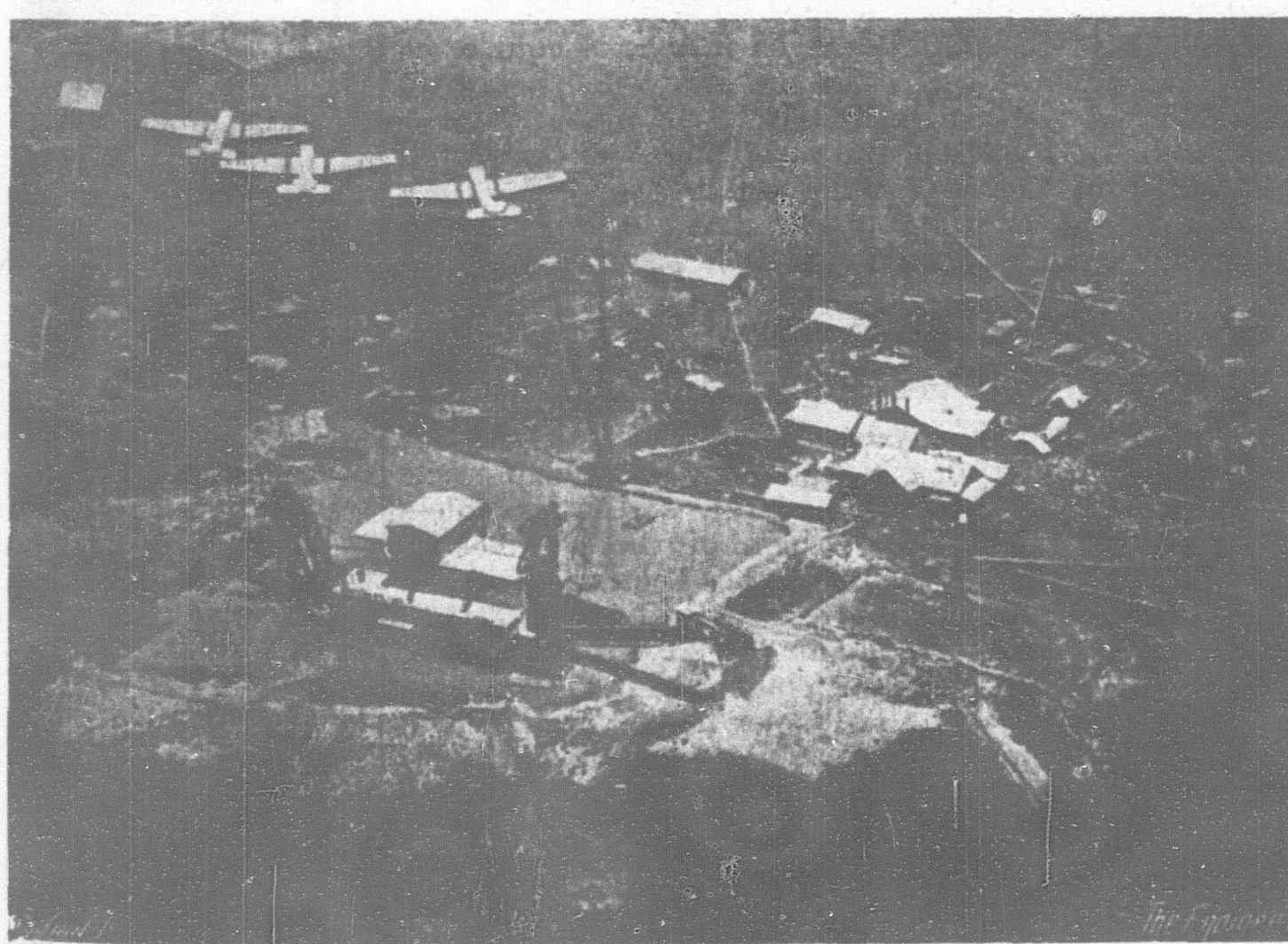
Two Junker G-31 aeroplanes were acquired, and transportation of the machinery from the coast to the field commenced in April, 1931, and, for the twelve months, to the end of March, 1932, a total of 2,500 short tons, comprising the whole of the above-mentioned equipment, had been safely transported by these two planes, and without a single accident. The tonnage was steadily built up from 35 tons in April, 1931, to 350 tons per month later on, when the staff became better organized and more accustomed to loading



Clearing Site for Aerodrome at Bulolo



Typical All-Metal Plane now operating in New Guinea



Aerial view of one Dredge and part of Aerodrome

the machines, and as the weather conditions improved.

Junker aeroplanes were considered the most suitable, as, first, being all metal in construction, they saved the very heavy cost of constructing hangars in New Guinea, and secondly, these machines were particularly suitable for heavy freighting, for, being of the low-winged type, the heavy weights could be crane-loaded through a hatch directly on to the cabin floor, which was rendered particularly strong by the fact that the strong wing section ran underneath, and formed part of, this floor.

The cargo compartment of the machine was 24-ft. long, 77-in. wide and 69-in. high, while the hatchway was 142-in. in length by 60-in. wide. The hatch was provided with a concave cover, so as to give an additional 12-in. of head room below the hatchway, and directly over the center of gravity, where the largest pieces were to be carried. The interior of the cargo compartment was free of obstructions, excepting two sets of stays, placed approximately 12-ft. and 18-ft. from the front of the compartment. These stays, which reduced the floor width to 31-in., angled back to meet the sides of the compartment at their junction with the roof. A side door was provided close to the rear for loading small material, and as a means of entering the cabin.

The Junker G-31 aeroplane has a pay load of 5,800-lb., allowing for a crew of two, and sufficient petrol for 3½ hours' flight. The average flying time from the coast (Lae) to the Bulolo dredging area and return being only 75 minutes, a reduction in the petrol load could be made to allow of the carrying, with two pilots, of 7,000-lb. of cargo, while at the same time retaining ample reserve of petrol.

Sufficient power was provided, in order that the fully loaded aeroplanes could be sustained in flight with any two engines—in the test flights

these planes, at an altitude up to 3,000-ft., actually climbed at the rate of 200-ft. per minute on two engines and under full load. This margin of power was a great insurance against forced landing and loss of life, material and time. The reserve of power was also of great importance in this particular case, as, with high mountains to cross, a fast rate of climb was important. Under normal working conditions the aeroplanes would climb to 7,000-ft. in thirty-five minutes with three-quarter throttle. The average height attained in crossing the mountain was 6,000-ft., while the useful ceiling of the machine is approximately 12,000-ft.

The flying distance from the coast airport (Lae) to Bulolo and return is 100 miles, and the average flying time for the return trip is seventy-five minutes. Over short distances such as this speed is not very essential, though it would be a factor in greater distances. The landing speed of the planes is approximately 75 miles per hour. This is rather high and, while compressed air brakes are fitted to check the run on landing, long aerodromes are required. The take-off distance of the planes is short on account of the reserve engine power. A quick take-off and a low landing speed greatly reduce the risk of accidents due to errors in judgment. An aerodrome 1,000 yards by 1,000 yards would be of sufficient size to allow of the landing of the planes in any direction. Actually both the Lae and the Bulolo aerodromes, while each being upwards of 1,000 yards in length, are not more than about 500 yards in width. This, however, is quite satisfactory, for the planes are always landed against the wind, and quite 99 per cent of the wind at Lae blows from either end of the aerodrome, while at Bulolo over 90 per cent blows up and down the aerodrome.

At the outset it was a question as to whether the port of Salamoia or that of Lae should be used, as the flying base. Lae, which was already being used by Guinea Airways, was finally decided upon, and early in 1930 a commencement was made on its further development. Lae is more or less an open roadstead, but with care no difficulty is experienced in lightering cargo from the ocean vessels which come to within about a quarter of a mile of the shore. A wharf was erected and a broad-gauge railway, three-quarters of a mile in length, was laid from the wharf to the existing Government aerodrome. Two 100-ton steel barges and a steam lighter were acquired for landing the cargo from the ship's side to the pier. A 10-ton locomotive crane transferred the equipment to trucks, and the same crane loaded it into the aeroplanes. The Government aerodrome at Lae was lengthened, and was generally made more suitable for the large aeroplanes which it would now have to serve, and storehouses, workshops, and white and native quarters were built to house the pilots, mechanics, and the native labor which was to be used for handling the equipment and servicing the aeroplanes. Further, a suitable concrete loading apron with petrol pumps was built. Due to the fact that the Lae aerodrome had little or no grade, and also on account of the very heavy rainfall at the coast, this aerodrome has never been very satisfactory, and at times it has caused a good deal of anxiety. It is hoped that a system of deep drainage, which is now in hand, will improve matters and make the ground safe for the landing of the heavy freight planes at any season of the year.

The construction of a suitable aerodrome at Bulolo was quite a major undertaking, and it involved many months of work with large gangs of natives under white foremen. A sandy gravel site was chosen at the downstream end of the property, and just off the dredging area. The dense tropical jungle, with trees up to 4-ft. in diameter, was cleared for a length of roughly 4,000-ft. by 1,500-ft. in width, and all trees were cleared away from the end boundaries for a distance of 500 yards. After the aerodrome area was cleared and all stumps removed the ground was graded so as to make the surface as uniform as possible. Fortunately, the site had a natural and gentle slope to the river, and this, with a large drain which was run on the top side, kept it free of surface water and generally well drained.

While the surface of the aerodrome was bare, the reflected heat of the sun gave the pilots some difficulty in keeping their machines at the correct altitude when landing. To overcome this the whole area was planted with "couch" grass. This grass took well and very rapidly spread and grew into a compact carpet about 12-in. thick. Continual cutting will cause the grass to develop a deep root system and bind the surface very effectively. The Bulolo aerodrome took seven months to complete, and cost approximately 30,000 dollars. It is an excellent ground and, since its completion, the only maintenance has consisted of keeping

the grass cut. The planes weigh approximately 19,000-lb. fully loaded, and the tires are inflated to 65-lb. per square inch. The continual landing of these heavy planes at 75 miles per hour has had little or no cutting effect on the surface of the Bulolo aerodrome.

The loading and unloading of heavy awkward parts of machinery need careful attention, but in spite of all care the hatchway and the sides and floor of the cargo compartment come in for an old bump now and again and so, after a while, the cabin shows signs of wear. Should any part of the cabin be badly damaged it can, of course, be cut away and replaced with spare material which is always kept on hand for repairing the body of the plane. To the end of March, 1932, each of the aeroplanes had completed approximately 625 hours of flying and, in the absence of a total loss by accident, it is probable that they will each be good for a further, say, 3,000 hours' flying.

After the planes had been in use for a short time the landing wheels commenced to collapse. This was brought about by the heat which was generated by the brake operating on the rim of the wheel, expanding the rim until it burst. Luckily no serious damage was done. The result was usually a rather dangerous swing just before the machine was brought to a standstill, and a worthless wheel, tire and tube. The design of the wheels was changed and since then no difficulty has been experienced.

The aeroplanes are each fitted with three 525 h.p. direct drive nine-cylinder radial air-cooled Hornet engines, making a total of 1,575 h.p. per plane. This gives a low-power loading of just over 12-lb. per horse-power, which accounts, in a measure, for the quick take-off and rapid climb of the machines. Three spare engines were acquired and a liberal supply of engine spare parts. The engines are run for about 200 hours before being removed from the plane for overhauling. Though only a "top overhaul" is then required, complete overhauls have always been made, as the extra cost and time incurred is more than offset by removing as far as possible the chance of engine failure from mechanical cause. While the life of an engine can be figured at about 2,000 hours, it is usually possible for the makers to recondition the engine with certain over and undersize parts and then to start it off on a second 2,000 hours.

At the Lae aerodrome the concrete loading apron was fitted with platform scales for weighing the tail of the plane. The aeroplane taxis on to this platform, always from the same end so that it will be in the correct position as regards the scales and fuelling plant, and the locomotive type loading crane then moves into its position just behind the wing for loading. The cargo is always loaded and unloaded from the rear, so that in case of accident the load falls on the back and more easily repaired part of the fuselage instead of on the wing or front portion. If the cargo has been correctly loaded the weight of the tail should be between 1,800-lb. and 2,200 lb. Should the weight be found to be above or below this amount, part of the cargo is adjusted forward or backward until the tail weight is within the required limits.

For the reason that the aeroplane was designed to carry long pieces, as well as heavy pieces, it is impossible to fly the machines empty, so that ballast has to be placed in the aft compartment in order to bring the tail weight up to the required 2,000-lb. or thereabouts on the return journey from Bulolo to Lae. Water ballast could be satisfactorily used, but as gravel was handy at Bulolo and was an asset at the loading platform at Lae, gravel in bags was used for this purpose.

The average load carried was 5,400-lb., but when the Lae aerodrome is better drained, and its surface generally improved, there is no reason why this should not be increased to around 6,000-lb., or even more. The greatest number of flights made in any one day, with one machine, was five. Under ideal weather conditions, five trips per plane could be made daily from Lae to Bulolo; with an average load of three tons per trip, this would mean the transportation of 900 short tons per 30-day month. To have made a single round trip by road from Lae to Bulolo would, no doubt, have taken a tractor at least a week—had a road existed.

Flying was not attempted when the weather conditions were at all unsatisfactory. In order to reduce as far as possible the weather hazard, two wireless telephone stations were established, one at Lae and the other at Bulolo. While, on account of the topography of the country and perhaps also the climate, this service was not entirely satisfactory, it aided the flying to a considerable extent. Pilots were able to leave Lae in the early morning, as soon as the Bulolo valley was reported by wireless as being clear

of fog, and, further, machines could be held at Bulolo should the weather conditions at Lae suddenly become unsettled.

Throughout the transportation of the whole 2,500 tons, necessitating approximately 1,000 trips, engine trouble developed during one flight only. On this occasion the center engine failed, due to installation trouble, and the loaded plane finished the flight, without difficulty, on the remaining two engines.

The total capital outlay for the aeronautical equipment and plant, plus the cost of operating the planes for the transportation of 2,500 short tons, but excluding amortization of equipment and plant, was, roundly, 550,000 dollars, plus 182,000 dollars, or 732,000 dollars. In comparing "air" with "road" transportation, it is perhaps fair to add to this figure of 732,000 dollars the cost of sectionalizing the dredges, and the extra cost of field erection. Mr. Griffin estimates the total extra cost of sectionalizing the two dredges at 10,000 dollars, and the total extra cost of field erection at 20,000 dollars, making 30,000 dollars in all. This, then, increases the above cost to 762,000 dollars.

Comparing the cost of road transport with the above, it is only possible to make a rough guess at what would have been the position had road transportation been adopted. To the estimated cost of 1,000,000 dollars for road construction has to be added, say, 75,000 dollars for hauling equipment and road house accommodation, together with, say, 125,000 dollars to cover the actual cost of transporting the equipment over the road and of maintaining the road. This is a total outlay of, say, 1,200,000 dollars as against, say, 762,000 dollars which has been expended in connection with the delivery of the equipment to Bulolo by air. There is still a further and very important benefit which has accrued to us from the air transportation. At least one year has been saved in time, and, with a tentative profit of something over 20,000,000 dollars in the Bulolo area, including the additional yardage recently acquired, the saving in interest at 5 per cent by the earlier winning of this profit, is more than sufficient to pay the entire cost of the aeroplanes and the handling of the whole of the equipment for four dredges and the power plant from the ship's side to the site of erection at Bulolo.

You will probably say that in one case, when the equipment was in, we would have had a road to the coast, whereas in the other case all we have is our aeroplanes. This is true, but in tropical New Guinea, we feel that the aeroplanes will probably be more satisfactory as a permanent connection to the coast than a road, and will cost less to maintain.

## New Highway Linking Shanghai and Hangchow Opened for Service

(Continued from page 457)

Mun Shan, a mountainous region with large forests of rare beauty. The total mileage of roads, including streets in the towns, amounts to 2,048 kilometers, and an additional 319 kilometers will be added when the Nanking-Wuhu, Hangchow-Hweichow and Hsuancheng-Changshing roads are completed.

(2). LICENCES.—For all cars travelling along the highways in Chekiang, Kiangsu and Anhwei Provinces, and in the Nanking and Shanghai districts, it suffices to have one licence, issued by any one of the above-mentioned five authorities.

(3). TEMPORARY REGULATIONS REGARDING TOOLS.—As a result of repeated meetings of the competent authorities of the Provinces of Kiangsu, Chekiang and Anhwei, and of the cities of Nanking and Greater Shanghai, held under the auspices of the National Economic Council, it has been decided that, as from January 1, 1933, all tolls for inter-provincial or inter-city traffic will be abolished. The present arrangements are as follows:

(a) Tolls.—The only toll now in existence is that at Minghong. All private passenger cars and motor cycles using the road will be exempted from any toll payment.

All commercial cars using the section of road between Shanghai and Minghong (including hired cars) are required to pay to the Motor Bus Company a toll charge according to the Company's practice.

(b) Ferry.—All commercial cars (including hired cars) passing the Minghong Ferry will be required to pay a fee at the discretion

of the Ferry Administration of the Kiangsu Reconstruction Department.

As soon as the new arrangement comes into force on January 1, 1933, this temporary system will be automatically abolished.

(4). FILLING STATIONS AND SERVICE STATIONS.—The provincial and city authorities above-mentioned have arranged with the proprietors of the motor omnibus stations *en route* to carry out any repairs or supply any fuel which may be required by passing motorists.

## The Sewerage System of Tokyo

(Continued from page 470)

cubic feet a second, as indicated in the sewerage plans for the city, will complete the pumping equipment for this station. Three of the former and three of the latter are in service now.

" Located in the central part of this district, Sannohashi pumping station will have seven large storm-water pumps with a total capacity of 700 cubic feet per second and five sewerage pumps with a total capacity of 100 cubic feet per second. Four of the former and four of the latter are in operation to-day.

" Kiba pumping station, in the southern part of district 3, is to have six storm-water pumps with a capacity totalling 560 cubic feet a second and six sewerage pumps with a capacity totalling 180 cubic feet a second. Four each of them are now in use.

Notwithstanding the strenuous efforts that have been exerted to provide adequate sewerage facilities in the city of Tokyo, on a scale commensurate with the needs of modern sanitation for an extensive metropolitan area with its inhabitants counted up into the millions, relatively little progress has been made to afford the benefits of a modern sewerage system to residential quarters within the city. And it is only in certain important business sections of Tokyo where an attempt has been successful in establishing a systematic sewerage service.

## Marconi Beam Services to be Employed in New China Wireless Stations

(Continued from page 481)

To-day every Continent is linked by its means. In Great Britain alone, Beam services are conducted with the United States of America, Argentina, Brazil, Egypt, Siam and Japan, in addition to the Dominions and India. The system has also been extensively adopted by other administrations, notably Belgium, Portugal and Spain, for direct high-speed communication with distant Colonial possessions or countries with which intimate diplomatic and commercial relations are maintained.

The Marconi Beam system is still considerably the most speedy means of long-distance communication in regular commercial use. Speeds up to 400 words per minute have been attained when warranted by the pressure of telegraphic traffic, while speeds of 150 to 200 words per minute are regularly worked.

In connection with the foregoing the International Telephone and Telegraph Corporation announce that an agreement has been concluded between the Minister of Communications of China and the Mackay Radio and Telegraph Co. for the exchange of radio telegraph traffic between China and the United States, Hawaii, and the Philippines. This development, together with the existing services to Honolulu and the Philippines, gives Mackay Radio a complete Transpacific service, in addition to its services to South America and Europe. A further agreement has been concluded between the Ministry of Communications of China and the China Electric Co., a subsidiary of the International Telephone and Telegraph Corporation, for the erection of four radio telephone transmitting and receiving stations for communication within China, one to be at Shanghai and the other three at other important cities in that country. In addition to these, an international radio telephone station will be built at Shanghai, so that the rest of the world can be connected to more than 100,000 telephones now in China.

# Increasing Demand for Priestman "Cub" Excavators Develops

**A** n increasing demand has been felt by public authorities, contractors and ballast merchants in this country for a small, mobile machine of light weight and low ground pressure, moderately priced and costing little to run.

To meet these requirements a new "Universal" Excavator, known as the "Cub" (a name that the Company has registered) having a capacity of  $\frac{1}{2}$  cubic yard, has recently been produced by Messrs. Priestman Brothers, Ltd., of Hull. This excavator, which is illustrated herewith, whilst designed on similar lines to the firm's larger machines, embodies certain new features found to be essential on a machine of the small size under review.

The "Cub," by the use of only two jibs, is readily convertible into a shovel, dragline, trencher, skimmer, grab, crane or light pile driver, and the weight in working order, complete with one attachment, is about six tons. The ground pressure is only seven-eight lbs. per square inch, so that the excavator is able to travel and work with safety on ground where the use of a larger and heavier machine would be impossible.

The undercarriage, with race, is of all-steel construction and the creeper track belts are constructed on similar lines to those incorporated in the larger excavators. They are the essence of strength and simplicity, being supported each by four cast steel rollers of large diameter running on full

length axles.

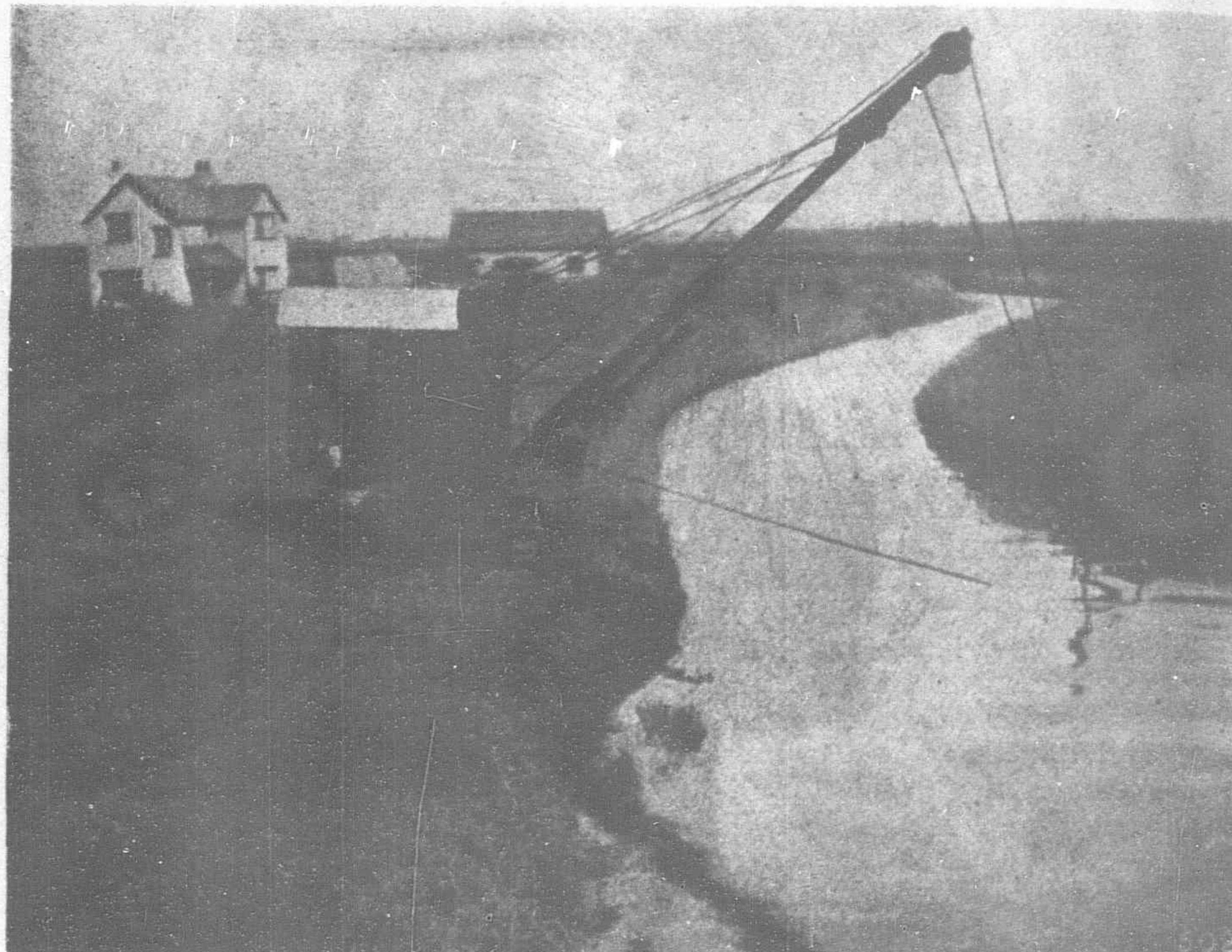
The power transmission to the final drive is through steel machine cut gearing protected from the ground by cast steel guards. No chain drives are employed in any part of the excavator.

The main bedplate, which carries both the winch and the engine mounting, is a single steel casting ensuring perfect alignment of the gearing throughout the life of the machine.

Ample reserve power is provided by a 4-cylinder engine suitable for running on paraffin after being started up on petrol and developing 20 and 25 horse-power respectively on these fuels, the consumption being about  $\frac{3}{4}$  gallon per hour.

The driver, for whom a seat is provided, has a clear and uninterrupted view of the work from his position at the front of the control platform, and the clutch levers and brake foot pedals are conveniently grouped in a quadrant within easy reach.

All gearing is of cast steel, machine cut, the main drive from the engine to the counter shaft running in an oil bath.



Showing the "Cub" excavator with dragline equipment, excavating silt, peat and clay in Lancashire, moving 23 cu. yds. per hour continuously under these conditions

Relay clutches of the Patent Priestman design are fitted to the hoisting and drag drums and the design of these clutches is such that only a finger touch effort on the part of the driver is necessary for their engagement.

The Patent "Level-Cut" grab, which is a new introduction, is worthy of particular notice. This grab has been proved ideal for cleaning the narrower ditches. It is held on the rope while it digs, takes a long level cut, leaving clean sides and a perfectly flat bottom, and the results are characterized by a complete absence of the potholes and ridges which are left by the usual type of plate grab.

The majority of the attachments are of similar design to those fitted to the larger excavators, and the change-over from one to the other can be carried out quickly and easily.

A strongly-constructed lock-up house provides ample security for the mechanism and protection for the operator during inclement weather.

The first "Cub" excavator has recently undergone extensive trials in the west of England, and has completely justified in every way, the claims made on its behalf.



Showing the "Cub" equipped with a skimmer, handling spoil from a stock heap. Note that only one jib is needed for skimmer, navvy and trencher



Hongkong and its Harbor from the Hillside with Clock Tower of Gloucester Building in View

## Hongkong Tells Time by Telechron\*

**P**ROMINENT in the downtown section of Hongkong, near the busy docks of its spacious harbor, a new and attractive building has been erected in the recent past, containing apartments, business offices, and on the ground floor, shops and arcades. Rising from the front corner, 135 feet above the street, a clock tower gives the time of day to dwellers of the city. It is visible for a long distance out in the harbor that teems with ships and small craft, and can be seen from the residential section in the hills whose rise is so abrupt from the business streets that an inclined railway is utilized for transportation.

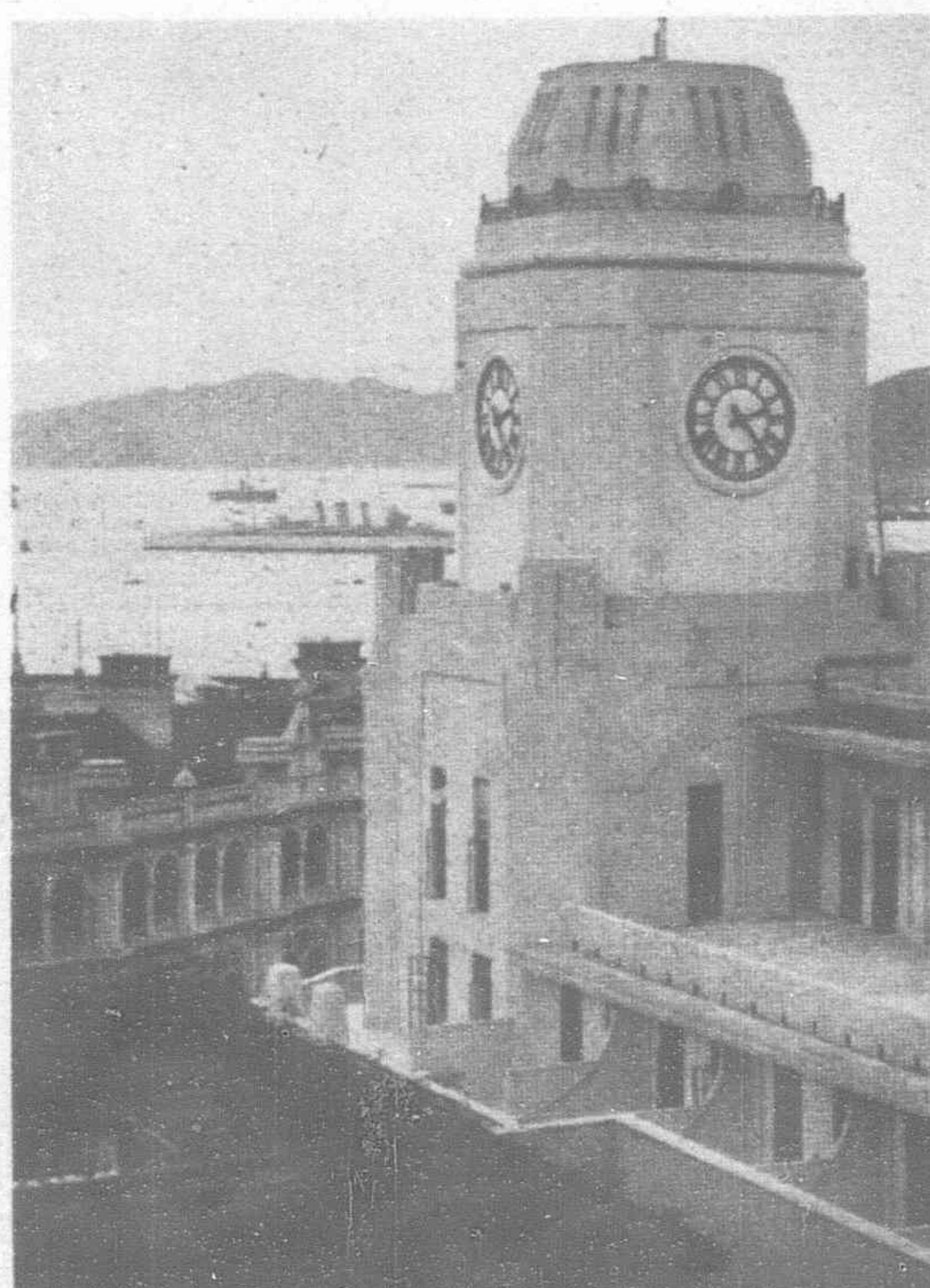
The Hongkong Land Investment Company, owners of this, the Gloucester Building, and its architects, Leigh & Orange of Hongkong, in taking upon themselves the rendering of a time service for so wide an area, took also an accompanying responsibility. It was of highest importance that the four great dials, on the four sides of their tower, should not only be always in accord as to the hour and minute but should point the correct time, so as to be depended on for accuracy and so that clocks and watches of all the city could be set to them as a standard.

The timepiece chosen was the Telechron, an electric clock that has made itself popular in homes and business places of many parts of the world because it never has to be wound, calls for no periodic attention, and tells the time of day with remarkable and

consistent accuracy. Each of the four dials on the Gloucester Building is 10 feet in diameter, and each has a little motor to drive the hands. The reason that the four motors run at identical speed is that each revolves at the identical speed of a motor in a master clock at the central station, and the reason that this and all other Telechrons on the system make the same number of revolutions in a minute is that, being synchronous motors, their speed is a function of the frequency of the alternating current that supplies them. By the aid of the master clock, this current is held to a constant frequency of so many cycles per second and all the Telechrons respond by a definite number of turns per minute. It is very ingenious, very simple, and very reliable.

To meet the remote contingency of a stoppage in current supply, provision is made for resetting the hands of the Gloucester Building clocks when current is restored. This is accomplished by feeding the motors temporarily at a considerably higher frequency from a special motor-generator set, thus speeding them up until the hands have caught up to their correct position in agreement with the master clock.

Gloucester Building is an ornament and business acquisition to Hongkong, and its towering clocks, with faces illuminated, give a very useful service by day and night.



The Dials, Ten Feet in Diameter, are seen from all directions

# Engineering Notes

## INDUSTRIAL

**SELANGOR CANNING FACTORY.**—The declared policy of all the Governments of Malaya is to find other strings to their industrial and agricultural bows since rubber and tin are no longer magic talismans. The pineapple canning industry holds out great promise, and the first step has been taken. Plans have been prepared for a model estate and canning factory in Selangor, but pending the decision of the F.M.S. Government with regard to the alienation of land for the purpose, work cannot proceed. The scheme has influential official and unofficial backing in Selangor. The combination of a high quality fruit packed by machinery in accordance with the latest methods will enable Malaya to enter a market she has hitherto only aspired to. If the scheme is put into operation it will be the forerunner of many others.

**SOVIET METAL INDUSTRY.**—The second blast furnace of the Kuznetz steel mill started operations on July 16. The first pig iron was poured within 23 hours after the furnace was blown in, as compared with three days for the first blast furnace. The amount of the first pouring totaled 89 tons, double that of blast furnace No. 1. Premiums have been awarded to outstanding workers on the two blast furnaces. Five workers received 1,000 roubles each, while an additional 10,000 roubles were assigned for premiums to other workers. The work of Mr. Ferguson, an American engineer, was particularly commended.

The second Magnitogorsk blast furnace, "Young Communist," broke all its previous records by producing on July 22 a total of 892 metric tons of metal. The furnace worked at a blow of 2,000 cubic meters per minute.

**NEW BAGUIO MILL.**—The Benguet Exploration Mining Co., owner of the Contact Mine, in Baguio, Philippine Islands, is placing bids for the installation of a 50 ton cyanide leaching plant to treat surface and underground ores. Further installations are planned for the future. Some of the materials already have been purchased, it is understood. The plant will be ready to operate shortly. A large compressor will be installed on the Contact property, and a 3,000-ft. tunnel driven to ascertain the location of one of the main veins. It is explained that this vein is cut off by a large earth fault, and it is necessary to drive through the fault in order to pick up the vein on the other side. An operating plant of 100 to 150 ton capacity is to be installed if and when the vein is picked up. The Benguet Exploration is the first among several new mining ventures in the Benguet district to proceed with installation. All of these new companies have been organized within the last two years.

**SHEET PILINGS IN JAPAN.**—Just recently large quantities of sheet pilings have been consigned to Japan for harbor works in Osaka, Yokohama and smaller bases for the Japanese fleet on the West coast. These were supplied by German Works, and they were made from a special iron for the purpose containing a certain percentage of copper rendering it perfectly resistant to rust, as has been discovered in actual practice. The new pilings may be employed for the most varied purposes and form an absolutely watertight enclosure. The material is unusually tough and possesses a high tensile strength so that the sheet pilings can be powerfully and rapidly rammed into hard ground without bending. The addition of copper renders the resistance to corrosion in sea water all the greater. Although a similar iron is being produced in Japan, German material was selected because it alone possesses the necessary qualities to render the pilings capable of standing up to such treatment to provide the necessary watertight enclosure.—*Uebersee Post.*

## RAILWAYS

**TRANSCAUCASIAN RAILWAY.**—A new railway is to be built across the Caucasian Mountains in the near future, connecting Gori in Georgia with Darg-Kokh in Northern Ossetia. It will lead through a tunnel at Roka and will be the shortest route to the northern slope of the mountains. The cost of the road, preliminary plans for which have already been prepared by a special government commission, is estimated at 100 million roubles.

**LOCOMOTIVES TESTED.**—The first tests of the electric locomotives on the Suram Pass in Georgia were to be held on July 1. The assembly of the locomotives, which were purchased from the International General Electric Company, was done under the supervision of its engineers. Italian engineers and experts have been engaged to supervise the installations of equipment for the sub-stations for the sections between Stalinsk and Zestafony. On June 27 the first current was furnished for the electrified railway leading through the Suram Pass. A 35,000-volt current was used for testing the contact line.

**FERRY LAUNCHED.**—The Nanking-Pukow railway ferry *Changkiang*, now under construction in England, will be launched in November and will be dispatched to China under its own steam immediately upon completion of all minor fittings, according to a message received by the Ministry of Railways from its Purchasing Commission in London. The vessel is expected to arrive at Nanking by the end of the year. The ferry will be placed on service across the Yangtze River at Pukow to link up through trains of the Nanking-Shanghai and Tientsin-Pukow Railways.—*Kuo Min.*

**LOAN FOR RAILWAY.**—It is reported that a loan agreement between the Chekiang Provincial Government and a financial syndicate at Shanghai for the completion of the Hangchow-Kiangshan Railway has been drafted and will be brought up before the Provincial Government Committee for confirmation. In order to obtain the necessary funds for the completion of that line, the Provincial Authorities, after protracted negotiations, have agreed to transfer control of the Hangchow, Yashih, Yuhang, and Szean electric works to the financial syndicate as security. It is understood that Mr. Li Ming, General Manager of the Chekiang Industrial Bank at Shanghai, will, on behalf of the syndicate, proceed to Hangchow shortly to complete the final arrangements.—*Kuo Min.*

## COMMUNICATIONS

**ROAD APPROPRIATIONS.**—Appropriations of 551 million roubles (\$383,000,000) have recently been approved for road construction in 1932 throughout the R.S.F.S.R. (Russian Republic proper). This is to be spent in connection with the building of 44,110 kilometers (27,500 miles) of improved dirt roads, 5,441 kilometers of hard surface roads and 341,342 meters of bridges.

**BONDS IN CHINA.**—A telegram from Sining, provincial capital of Kokonor (Chinghai), to Nanking reports that the recently completed highways in that province now serve to link up Sining with Lanchow, the Kansu provincial capital, and other distant parts of Kokonor. The Sining-Lanchow Highway now brings Sining to within one day's journey from Lanchow, the distance being slightly over 100 miles. Sining is also connected with Shuhsien, in the western section of the province, by a highway 1,100 miles long, which has rendered it possible to reach the provincial capital by motor-bus in six days.—*Kuo Min.*

**SHANGHAI HARBOR MAP.**—An excellent new map of Shanghai harbor has just been published by the Whangpoo Conservancy Board clearly showing all berthing facilities in the harbor. The map is obtainable from the office of the Engineer-in-Chief of the Whangpoo Conservancy Board at Shanghai at the price of \$2.

**LAKE DREDGING.**—Plans are being made by the Hunan Provincial Government for the dredging of the Tungting Lake, in northern Hunan, and its rivers, the Siang Kiang, Tzu Kiang, Yuan Kiang and Li Kiang, in order to remove the flood menace to the province. The lake, which is gradually filling up with silt, now constitutes an impediment to the flow of the waters of these four rivers. As dredging operations on the entire lake itself cannot be undertaken at the present juncture when the Government is facing financial difficulties, it has been decided to concentrate attention on important points both along the rivers and at their outlets to the lake.—*Kuo Min.*

## SHIPPING

**BANGKOK CANAL.**—The Siamese Government, in spite of severe retrenchments, is not losing sight of possibilities for development. A recent *Gazette* gave particulars of a decree declaring a huang ham boundary, namely, an area reserved for a period of five years, which shall be considered to be for the own use of the Government. An explanation accompanying the notification states that the shallow bar at the mouth of the river does not permit the passage of vessels of heavy tonnage, and it is the purpose of the Government to improve communication between the sea and the harbor of Bangkok, to facilitate the trade of the country. It is understood that through the area marked off a ship canal is to be cut that will give passage to vessels of any size. This is a development which would obviously effect a great saving of time and money.

**SEEKS SUBSIDY.**—It is reported that Japanese shipping interests have asked their Government for a subsidy of Y.20,000,000 to aid the services of foreign routes. It is pointed out that the major financial difficulties faced by Japanese shipping have been the fall in the value of the £ sterling; the inability to increase freight rates without loss of trade and the certain loss in revenue by maintaining old rates; and the diversion of important American and Australian cargoes to vessels other than Japanese under the Chinese boycott. It is stated that the problem was partially met in 1931 by working agreements between the larger shipping Companies, but that this has not sufficed to relieve the acute situation in general, and many charterers have had to cancel contracts. Prohibition of importation of foreign tonnage has also been sought as a partial remedy.—*Fairplay.*

## AVIATION

**AIRPORTS PLANNED.**—The Tokyo Communications Office has decided to build three commercial airports, each with an area of 160,000 tsubo, or slightly more than 130 acres, on the northern stretch of Japan's proposed trunk airway, subject to the approval of the Diet. These airports will be erected at Sendai, Aomori, and Sapporo, for which the Finance Office has consented to appropriate a sum of Y.1,100,000 for the current fiscal year. The Government intends to start construction work immediately upon obtaining the Diet approval. The Communications Office will establish regular passenger and airmail service between Tokyo and Asahikawa, by using the proposed three airports as the connecting links, starting with one round trip each way daily except Sundays.